# FLORIDA'S STATE ACADEMIC STANDARDS
# COMPUTER SCIENCE 2024



FLORIDA COMPUTER SCIENCE STANDARDS AND BENCHMARKS
WITH CLARIFICATIONS AND EXAMPLES

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WITHOUT **EDUCATION** HE LIVES WITHIN THE NARROW, DARK AND GRIMY WALLS OF IGNORANCE. ... EDUCATION, ON THE OTHER HAND, MEANS EMANCIPATION. IT **MEANS LIGHT AND LIBERTY**. IT MEANS THE UPLIFTING OF THE SOUL OF MAN INTO THE GLORIOUS LIGHT OF TRUTH, THE LIGHT ONLY BY WHICH MEN CAN BE MADE FREE. **TO DENY EDUCATION TO ANY PEOPLE IS ONE OF THE GREATEST CRIMES AGAINST HUMAN NATURE.** IT IS TO DENY THEM THE MEANS OF FREEDOM AND THE RIGHTFUL PURSUIT OF HAPPINESS AND TO DEFEAT THE VERY END OF THEIR BEING.

-FREDERICK DOUGLASS
 BLESSINGS OF LIBERTY AND EDUCATION. SPEECH. 1894.

## Introduction

Access to high-quality education is a fundamental value for Florida's students through the Florida Constitution. It is in the best interest of all Floridians to give our children an education that fully prepares them for success. Florida leaders must ensure students are prepared to be civically engaged and knowledgeable citizens who positively impact our communities. Florida's State Academic Standards for Computer Science were developed with Floridians' input and countless hours of work from dedicated Florida educational leaders and computer science educators. This work is a testament to our students' potential for unprecedented success. It is a call to action for all of us in Florida, emphasizing our collective responsibility and empowering us to implement the necessary infrastructure to help them thrive.

High-quality state academic standards are the foundation of a high-quality system to which assessments and instructional materials must be aligned. With these new and improved standards, Florida builds on past strengths and learns from past lessons. Built on foundations of reading, writing, and arithmetic, Florida's State Academic Standards for Computer Science are the best in the nation.

Florida's State Academic Standards for Computer Science, a product of parents' considerations, stakeholder feedback and educators' practical experience, are designed to provide a robust foundation for our students. These standards not only enhance the quality of instructional materials and streamline assessments but also ensure that our high school graduates are fully equipped for the responsibilities associated with American citizenship.

Throughout the year-long process of evaluating, listening, rethinking, and ultimately rewriting Florida's computer science standards, the department actively sought the input of numerous stakeholders, including many educators. This multi-faceted public input process is a testament to the collective thought and input of many Floridians who hold student-centered results close to heart. Therefore, Florida's State Academic Standards for Computer Science will be revised periodically. These revisions ensure that the standards remain up to date with technological

advancements, align with current educational goals, and prepare students for success in the modern world.

Development of Florida's State Academic Standards for Computer Science
The development of these standards and benchmarks comes from section 1007.2616, Florida Statutes, where computer science courses and content are defined as those that provide students with the opportunity to learn coding, computing principles, and computational thinking. Florida's State Academic Standards for Computer Science were written by a workgroup consisting of Florida computer science teacher experts and other stakeholders. The educator experts represent the individuals in Florida who have leadership roles in K-12 computer science and the Florida College System. Throughout the development of the standards and benchmarks, the workgroup focused on writing standards and benchmarks that are clear and concise and provide enough guidance so that districts, test developers, publishers, and other related stakeholders are able to align instructional materials, instruction, and assessment. The computer science educator expert workgroup drew on the work and comments from the public and stakeholders.

Changes and Improvements
- *Clarity*
  Florida's State Academic Standards for Computer Science outline specific, achievable learning objectives for each grade level. This helps teachers understand what is expected and ensures students grasp fundamental concepts before moving on to more complex topics.
- *Practicality*
  The standards are designed to be practical, building on concepts gradually. Starting with basic digital literacy and computational thinking in early grades, it moves toward more advanced topics like coding, algorithms, and data analysis in higher grades. This step-by-step and practical approach makes it easier for students to follow and for teachers to instruct.
- *Alignment*
  Computer science concepts are integrated with other content areas, allowing students to see the relevance of computer science in various contexts. This interdisciplinary approach simplifies learning by connecting new information to prior knowledge in familiar subjects.
- *Computational*
  Computational thinking, which involves problem-solving skills and logical reasoning, is a central focus. Teaching these skills early and continuously will help students understand and apply computer science principles effectively.

The Florida Department of Education is deeply grateful to all the Floridians who contributed to this project. In particular, we would like to express our heartfelt thanks to the educator experts who served on the workgroup representing Florida teachers and students.

## Florida's State Academic Standards for Computer Science Coding Scheme

Florida has a unique coding scheme defined by five character places in an alphanumeric code: the subject, grade level, strand, standard, and benchmark. For Kindergarten through grade 8, the coding scheme is defined by each individual grade level. For grades 9-12, the scheme is banded and organized by strands. The strand is a focal group of related standards. Standards are overarching criteria for the grade level or grade band. The benchmark is a specific expectation for the grade level or grade band that falls within the standard. The computer science content within the benchmarks is to be learned during the year and mastered by the end of the year. It is important to note that benchmarks from different strands may be closely related because computer science is an interconnected subject.

### K-8 Example

| Subject | Grade Level | Strand | Standard | Benchmark |
|---|---|---|---|---|
| **SC.** | **4.** | **CO.** | **1.** | **2** |
| Science | Grade 4 | Computing Components | Introduce foundational computer literacy skills. | Create and edit multimedia artifacts using digital tools. |

### 9-12 Example

| Subject | Grade Level | Strand | Standard | Benchmark |
|---|---|---|---|---|
| **SC.** | **912.** | **PE.** | **1.** | **2** |
| Science | Grades 9-12 | Programming and Software Engineering | Demonstrate program logic. | Create iterative and non-iterative structures within a program. |

### Computational Thinking and Reasoning Standards Example

| Subject | Grade Level | Strand | Standard | Benchmark |
|---|---|---|---|---|
| **SC.** | **K12.** | **CTR.** | **6.** | **1** |
| Science | Kindergarten through grade 12 | Computational Thinking and Reasoning | Differentiate between usable data and miscellaneous information. | *no meaning* |

It is important to note that the 5th place will always be a "1" for the Computational Thinking and Reasoning Standards. The "1" has no meaning but serves as a placeholder in fulfilling Florida's unique coding scheme.

**Progression of Florida's State Academic Standards for Computer Science**

The table below illustrates Florida's State Academic Standards for Computer Science strands. For each strand in Kindergarten through grade 12, the shaded areas indicate the grade levels where it is addressed. Most of the strands span multiple grade levels, which lends itself to the progression of computer science and the coherence across courses.

| K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9-12 |
|---|---|---|---|---|---|---|---|---|---|

Communication and Collaboration (CC)

Personal Health and Safety (HS)

Computing Components (CO)

Programming and Software Engineering Strand (PE)

Technological Impact (TI)

Emerging Technologies (ET)

Cyber Security (CS)

Digital Currencies and Financial Management (DC)

Computational Thinking and Reasoning Standards (CTR)

**Computational Thinking and Reasoning Standards**

## Computational Thinking and Reasoning Standards

Florida students are expected to engage with computer science through Computational Thinking and Reasoning (CTR) Standards. These standards are written in clear language so that all stakeholders can understand them, and students can use them as self-monitoring tools. The CTR standards promote deeper learning and understanding of computer science. The clarifications are included to guide teachers in the integration of the CTR Standards within computer science instruction.

### SC.K12.CTR.1.1 Actively participate in effortful learning both individually and collaboratively.

Students who actively participate in effortful learning both individually and with others:
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of learners.
- Foster perseverance in students by choosing challenging tasks.
- Recognize students' effort when solving challenging problems.
- Emphasize project-based learning.
- Establish a culture in which students ask questions of the teacher and their peers, and errors as a learning opportunity.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### SC.K12.CTR.2.1 Demonstrate understanding by decomposing a problem.

Students who demonstrate understanding by decomposing a problem:
- Analyze the problems in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Break down complex problems into individual problems.
- Decompose a complex problem into manageable parts.

Clarifications:
Teachers who encourage students to demonstrate understanding by decomposing a problem:
- Develop students' ability to analyze and problem-solve.
- Help students break complex tasks into subtasks.
- Show students that the solution to individual parts allows them to solve complex problems more effectively.

### SC.K12.CTR.3.1 Complete tasks with digital fluency.

Students who complete tasks with digital fluency:
- Select and use appropriate digital tools by their functions.
- Demonstrate proper typing techniques and keyboarding skills.
- Understand responsible technology use.
- Use feedback to improve efficiency using digital tools.
- Relate previously learned concepts to new concepts.
- Solve problems by developing, testing and refining technological processes.

Clarifications:

Teachers who encourage students to complete tasks with digital fluency:
- Provide students with opportunities to increase critical thinking skills.
- Provide students with opportunities to use various technology hardware and software, so that technology is an integral part of the learning experience.
  Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### SC.K12.CTR.4.1 Express solutions as computational steps.

Students who express solutions as computational steps:
- Solve problems step by step rather than all at once.
- Represent solutions to problems in multiple ways, based on context or purpose.
- Use patterns and structures to understand and connect computational concepts.
- Check computations when solving problems.

Clarifications:

Teachers who encourage students to express solutions as computational steps:
- Provide opportunities for students to develop sequentially based understandings of problems.
- Guide students to align tasks to a step-by-step solution.
- Select sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justification.

### *SC.K12.CTR.5.1 Create an algorithm to achieve a given goal.*

Students who create algorithms to achieve a given goal:
- Create or use a well-defined series of steps to achieve a desired outcome.
- Compare the efficiency of an algorithm to those expressed by others.
- Design a sequence of steps to follow.
- Verify possible solutions by explaining the program or methods used.

Clarifications:

Teachers who encourage students to create an algorithm to achieve a given goal:
- Support students to develop generalizations based on the similarities found among problems.
- Have students estimate or predict solutions before solving.
- Help students recognize the patterns in the world around them and connect these patterns to other concepts.

### *SC.K12.CTR.6.1 Differentiate between usable data and miscellaneous information.*

Students who differentiate between usable data and miscellaneous information:
- Express connections between concepts and representations.
- Construct possible arguments based on evidence.
- Perform decision-making between two actions.
- Practice evaluating information and sources.
- Perform investigations to gather data or determine if a program or method is appropriate.
- Discern relevant, meaningful data from irrelevant or extraneous information.
- Understand the characteristics and criteria determining whether data is relevant to a specific problem or task.

Clarifications:

Teachers who encourage students to differentiate between useable data and miscellaneous information:
- Support students as they validate conclusions by comparing them to the given situation.
- Create opportunities for students to discuss their thinking with peers.

### *SC.K12.CTR.7.1 Solve real-life problems in science and engineering using computational thinking.*

Students who solve real-life problems in science and engineering using computational thinking:

- Adapt procedures to find solutions and apply them to a new context.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.
- Connect concepts to everyday experiences.
- Use programs, models and methods to understand, represent and solve problems.
- Indicate how various concepts can be applied to other disciplines.
- Redesign programs, models and methods to improve accuracy or efficiency. Evaluate results based on the given context.

Clarifications:

Teachers who encourage students to solve real-life problems in science and engineering using computational thinking:

- Create learning opportunities that require logical reasoning and problem-solving skills.
- Provide opportunities for students to create plans and procedures to solve problems.
- Provide opportunities for students to create programs or models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their programs, models and methods.

# Computer Science K-5

## Kindergarten

## Communication and Collaboration Strand

### *SC.K.CC.1 Develop an understanding of collaborative conversations.*

SC.K.CC.1.1    Provide positive feedback.
Benchmark Clarifications:
*Clarification 1:* The expectation is for students to provide specific compliments on peer projects.

## Personal Health and Safety Strand

### *SC.K.HS.1 Determine safe Internet practices.*

SC.K.HS.1.1    Determine the risks of Internet usage.
Benchmark Clarifications:
*Clarification 1:* Students should be aware of the risks if they are interacting with other people online.
*Clarification 2:* Students should know that unsafe practices include sharing their information like phone number, address and other identifying information with strangers.

SC.K.HS.1.2    Explore the need for adult permission before using a network-capable device.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing how someone can have safe and unsafe interactions with others while online.

SC.K.HS.1.3    Discuss that a password helps protect the privacy of information.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the importance of not sharing a password with anyone other than a parent or guardian.

SC.K.HS.1.4    Explain that some information is private and should not be shared online or in person.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the importance of not sharing information with anyone other than a parent or guardian.

**SC.K.HS.2 Explore how the use of digital devices can affect your health.**

SC.K.HS.2.1    Explore the impact that technology has on the senses.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussion on how technology positively and negatively affects the five senses.

SC.K.HS.2.2    Explore how to create a healthy balance between physical activity and time spent on a digital device.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the balance between health and time spent on a digital device.

## Computing Components Strand

**SC.K.CO.1 Identify computer components.**

SC.K.CO.1.1    Recognize components of computing devices.
Benchmark Clarifications:
*Clarification 1:* Instruction includes recognizing the differences between a laptop and a desktop computer.

SC.K.CO.1.2    Identify what types of computer components can be used with senses.
Benchmark Clarifications:
*Clarification 1:* Instruction includes discussion on how headphones, screens and keyboards affect the five senses.

SC.K.CO.1.3    Identify tools used for creative expression.

SC.K.CO.1.4    Create a project that expresses thoughts and ideas.

SC.K.CO.1.5    Explore the keyboard of a computer through Consonant-Vowel-Consonant (CVC) words.
Benchmark Clarifications:
*Clarification 1:* Consonant-Vowel-Consonant (CVC) words include "cat" or "dog."

SC.K.CO.1.6    Recognize that universal icons represent tools or information.

SC.K.CO.1.7    Discuss proper care for electronic devices.

Benchmark Clarifications:

*Clarification 1:* Proper care includes handling devices carefully, logging off or shutting down correctly and keeping devices away from food or drinks.

*Clarification 2:* Instruction includes teaching keeping food and drinks away from computers and other hardware such as keyboards, screens, mice, printers and tablets.

*Clarification 3*: Instruction includes teaching proper ways to carry and store computers or devices.

*Clarification 4:* Instruction includes teaching to keep magnets away from computers and screens.

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## Programming and Software Engineering Strand

### SC.K.PE.1 Recognize that tasks are completed in a sequential order.

SC.K.PE.1.1    Discuss how a computer program is a set of instructions made by people to show a computer how to complete a task.

SC.K.PE.1.2    Develop a series of steps to complete a task.
*Example:* Students brainstorm how to make a sandwich.

### SC.K.PE.2 Identify data.

SC.K.PE.2.1    Recognize different types of data.

Benchmark Clarifications:

*Clarification 1:* Instruction includes defining data as a collection of information that can be used to sort and organize details.

SC.K.PE.2.2    Use different data representations to make comparisons.

Benchmark Clarifications:

*Clarification 1:* Types of data representations include tally marks or pictographs.

### SC.K.PE.3 Introduce problem-solving.

SC.K.PE.3.1    Arrange or sort information.

SC.K.PE.3.2    Solve problems involving logical order thinking or sequencing with or without technology.

Benchmark Clarifications:

*Clarification 1:* Problem types include putting things in order or sequence, either with or without technology.

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SC.K.PE.3.3    Observe patterns of daily life and routines.

Benchmark Clarifications:

*Clarification 1*: Instruction includes describing steps missing in scenarios for an intended outcome.

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SC.K.PE.3.4    Create and use repeating patterns using letters, numbers or symbols.

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## Technological Impact Strand

### SC.K.TI.1 Introduce the technological progress.

SC.K.TI.1.1    Explore the use of technology in daily life.

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### SC.K.TI.2 Explain the importance of rules.

SC.K.TI.2.1    Introduce and state the importance of rules.

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## Grade 1

### Communication and Collaboration Strand

*Communicate information both individually and collaboratively.*

SC.1.CC.1.1    Communicate and collaborate with teachers and other students with and without the use of technology.

### Personal Health and Safety Strand

*SC.1.HS.1 Determine and explain safe and healthy Internet practices.*

SC.1.HS.1.1    Define and recognize the risks of Internet usage.

SC.1.HS.1.2    Explain the need for adult permission before using a network-capable device.

SC.1.HS.1.3    Recognize why student identification is considered secure information.

*SC.1.HS.2 Discuss how the use of digital devices can affect your health.*

SC.1.HS.2.1    Define and discuss what makes a healthy balance between unplugged activities and time spent on a digital device.
Benchmark Clarifications:
*Clarification 1:* Unplugged activities include reading a physical book, playing a sport, completing a puzzle or playing a game outside.

### Computing Components Strand

*SC.1.CO.1 Differentiate and utilize computer components.*

SC.1.CO.1.1    Recognize and operate different types of computer components.
Benchmark Clarifications:
*Clarification 1:* Instruction includes using word processor and input/output devices such as a mouse, keyboard or touch screen.

SC.1.CO.1.2    Create and review projects using digital tools.

SC.1.CO.1.3    Identify tools that can be used for data collection.

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SC.1.CO.1.4    Identify tools that can be used for sharing information.
Benchmark Clarifications:
*Clarification 1:* Tools include storyboards, posters, photos, journals, magazines or newspapers.

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SC.1.CO.1.5    Demonstrate how to complete a task using a digital device.
Benchmark Clarifications:
*Clarification 1:* Instruction includes tasks such as completing practice tests, homework and surveys.
*Clarification 2:* Instruction emphasizes the responsible use of completing tasks effectively.

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SC.1.CO.1.6    Discuss the importance of saving digital work.
Benchmark Clarifications:
*Clarification 1:* Students should discuss reasons why it is important to save their work periodically instead of waiting until they complete it.

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SC.1.CO.1.7    Use the keyboard of a computer to write consonant-vowel-consonant (CVC) and consonant-vowel-consonant-e (CVCe) words.
Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of a keyboard or a printed version of a keyboard.

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SC.1.CO.1.8    Type a username and password accurately.
Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding the difference between typing capital and lowercase letters.
*Clarification 2:* Passwords include the use of letters, numbers and symbols.

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SC.1.CO.1.9    Recognize and operate different types of computer applications.
Benchmark Clarifications:
*Clarification 1:* Instruction includes demonstrating the correct use of logging into a computer and launching applications from the desktop.

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SC.1.CO.1.10   Create multimedia files.
Benchmark Clarifications:
*Clarification 1:* Instruction includes clarifying that multimedia can be audio, video or both.

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SC.1.CO.1.11   Demonstrate proper care for electronic devices.
Benchmark Clarifications:
*Clarification 1:* Instruction includes demonstrating how to properly shut down a computer.

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**Programming and Software Engineering Strand**

### SC.1.PE.1 Demonstrate that coding is developing a set of instructions.

SC.1.PE.1.1    Explain that a computer program can only follow a set of instructions made by people to complete a task.

### SC.1.PE.2 Recognize types of data.

SC.1.PE.2.1    Determine what makes data important.

Benchmark Clarifications:
*Clarification 1:* Instruction includes providing opportunities for students to discuss why data may be important to them.
*Clarification 2:* Instruction includes understanding that depending on the person and the context and their justification, some data may be important to one person but not important to another person.

SC.1.PE.2.2    Sort data using visual representation tools.

*Example:* Sort a bag of chocolate candies based on their color. After, compare your sorted candies with a partner.

Benchmark Clarifications:
*Clarification 1:* Representations include two-column charts, pictographs and tally marks.
*Clarification 2:* When sorting, students can look for trends in the data.

SC.1.PE.2.3    Recognize the type of data needed to be collected and use it to solve a specific problem using models.

### SC.1.PE.3 Recognize problem-solving strategies.

SC.1.PE.3.1    Create a pattern that can be repeated to complete a task.

*Example:* What numbers can you repeatedly add to each other to get to 100?

SC.1.PE.3.2    Extend a repeated pattern.

SC.1.PE.3.3    Describe how data collected from models can be used to solve real-world problems.

## Technological Impact Strand

### SC.1.TI.1 Comparing technological progress over time.

| SC.1.TI.1.1 | Discuss that individuals can use computing technology in the workplace or school to perform many important tasks and functions. |

| SC.1.TI.1.2 | Explore that individuals can use computing technology at home to perform many important tasks and functions. |

| SC.1.TI.1.3 | Explore Artificial Intelligence (AI)-powered devices. |

Benchmark Clarifications:
*Clarification 1:* Instruction includes introducing the concept of Artificial Intelligence (AI) by identifying smart toys.

### SC.1.TI.2 Recognize the importance of accurate information.

| SC.1.TI.2.1 | Identify why personal information should be kept private. |

| SC.1.TI.2.2 | Compare information from two different digital resources on the same topic to confirm accuracy. |

## Grade 2

### Communication and Collaboration Strand

### *SC.2.CC.1 Communicate information with digital tools.*

SC.2.CC.1.1   Identify a variety of digital tools used for communication.
Benchmark Clarifications:
*Clarification 1:* Instruction includes identifying digital tools such as Internet applications, online catalogs and databases.
*Clarification 2*: Instruction includes recognizing the Internet as a means of communication.

SC.2.CC.1.2   Describe the similarities and differences among the Internet, websites and online applications.
Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding what the Internet is and how it works, and what websites and online applications are and how they work.

SC.2.CC.1.3   Complete basic keyword searches.
Benchmark Clarifications:
*Clarification 1:* Instruction includes child-friendly searches on a safe search engine or browser.
*Clarification 2*: Instruction includes the connection to using a dictionary, glossary or encyclopedia.

SC.2.CC.1.4   Identify concepts illustrated by a simple simulation.
Benchmark Clarifications:
*Clarification 1:* Instruction includes concepts such as growth, human health and the butterfly life cycle.

### Personal Health and Safety Strand

### *SC.2.HS.1 Determine safe and unsafe Internet practices.*

SC.2.HS.1.1   Identify examples of safe and unsafe online communications.

SC.2.HS.1.2   Demonstrate why personal or family member login usernames, passcodes, passwords and secure logins should not be shared with other people.
Benchmark Clarifications:
*Clarification 1:* Instruction includes teaching students to store passwords in a secure location.

SC.2.HS.1.3    Discuss the difference between weak and strong passwords.

*Example:* Alana is creating a password for her school account. She knows she must use 10 characters. These characters should include a number and a capital letter. Give an example of a strong password and a weak password.

Benchmark Clarifications:

*Clarification 1:* Instruction includes teaching what constitutes a strong password.

SC.2.HS.1.4    Recognize that digital content posted online should have the consent of the subject.

*Example:* Wes took a photo of his friend and posted it online without asking. Discuss why this is inappropriate.

Benchmark Clarifications:

*Clarification 1:* Instruction includes discussing how to respect others' privacy, as well as one's own privacy.

*Clarification 2*: Digital content includes videos, pictures and audio (sound bites).

### SC.2.HS.2. *Discuss the development of healthy digital practices.*

SC.2.HS.2.1    Identify healthy digital use habits.

*Example:* Record the number of minutes you spend on an electronic device every day for two weeks. Compare the number of minutes from each week. What are some ways you could reduce your amount of screen time?

*Example:* Record the number of minutes you spend on an electronic device every day for two weeks. Categorize the number of minutes by how you spent time on the electronic device. Create a bar graph to represent your screen time.

Benchmark Clarifications:

*Clarification 1:* Instruction includes the use of an application, stopwatch, timer or clock to determine the number of minutes on an electronic device.

SC.2.HS.2.2    Identify if there is a need to reduce screen time and how that can be done.

Benchmark Clarifications:

*Clarification 1:* Instruction includes creating a list of activities that could be done in place of the use of technology.

## Computing Components Strand

### SC.2.CO.1 Evaluate computer components.

SC.2.CO.1.1    Identify the characteristics of hardware.
Benchmark Clarifications:
*Clarification 1:* Instruction includes using input/output devices such as a mouse, speakers, printer, monitor, keyboard or touch screen to find, navigate and launch a program.
*Clarification 2:* Students should understand that hardware is the physical component of a computer system.

SC.2.CO.1.2    Demonstrate the proper handling of computers and devices.
Benchmark Clarifications:
*Clarification 1:* Instruction includes teaching students to keep food and drinks away from computers and other hardware such as keyboards, screens, mice, printers and tablets.
*Clarification 2:* Instruction includes teaching students proper ways to carry and store computers or devices.
*Clarification 3:* Instruction includes teaching students to keep magnets away from computers and screens.

SC.2.CO.1.3    Use the keyboard of a computer to write simple sentences.
Benchmark Clarifications:
*Clarification 1:*  Instruction includes the use of a keyboard or a printed version of a keyboard.

SC.2.CO.1.4    Create an audio or video recording.

SC.2.CO.1.5    Create and present a digital product.

SC.2.CO.1.6    Explain that a computer program is running when a program or command is executed.

SC.2.CO.1.7    Identify the characteristics of software.
Benchmark Clarifications:
*Clarification 1:* Instruction includes the understanding that software is the actual programs that are running on a computer.
*Clarification 2*: Instruction includes comparing the characteristics of hardware and software.

SC.2.CO.1.8    Introduce network system tools and how to determine if they are connected to a network.
Benchmark Clarifications:
*Clarification 1:* Students should be able to determine from the symbol whether or not they have a network connection.
*Clarification 2*: Instruction includes recognizing a network system symbol on a computing device.

SC.2.CO.1.9     Identify the strength of a network system from the symbol on a computing device.
          *Example:* Mr. Thompson has his class count the bars on their tablets in the classroom to see the strength of the network signal. The class then takes their devices out to the playground and counts the bars again. What do you know about the signal strength between being in the classroom and on the playground?

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the expectation is to look at the network system symbol to determine the strength of the network connection.

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### Programming and Software Engineering Strand

### *SC.2.PE.1 Introduce conditional logic.*

SC.2.PE.1.1     Construct code segments using tools that do not require a textual programming language.
          *Example:* Poppy is writing directions to help her puppy to the food bowl. Poppy will be using a block-based program to demonstrate to her puppy how to get to the food bowl. Can you help Poppy write part of the code to tell the puppy how many steps to take and when to turn?

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### *SC.2.PE.2 Sort types of data.*

SC.2.PE.2.1     Collect data using a variety of computing methods.
Benchmark Clarifications:
*Clarification 1:* Instruction includes sorting and totaling as a collection tool.

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SC.2.PE.2.2     Explore dividing a collection of data or objects into like groups.

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SC.2.PE.2.3     Create data visualizations.
Benchmark Clarifications:
*Clarification 1:* Instruction includes creating bar graphs, pictographs, tables or infographics as data visualizations.

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### SC.2.PE.3 Model problem-solving strategies.

SC.2.PE.3.1    Create a repeatable pattern, with or without technology, to solve a problem.
*Example:* Use a word processor to create a repeated pattern using letters.

Benchmark Clarifications:
*Clarification 1*: Patterns can be created using manipulatives, building bricks, visuals, numbers, music or technology.
*Clarification 2*: Students discussing and creating repeated patterns will build the foundation for loops and algorithms in later courses.

SC.2.PE.3.2    Develop a plan that could be used to create a story.

Benchmark Clarifications:
*Clarification 1:* Instruction emphasizes creating a story in a step-by-step manner.
*Clarification 2:* Instruction makes the connection to developing an algorithm.
*Clarification 3:* When developing a plan, students can use graphic organizers, storyboards or flowcharts.

SC.2.PE.3.3    Demonstrate the use of conditional logic.

*Example:* If it is raining, then students cannot go outside for recess.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using conditional logic: if-then statements and while loops.

SC.2.PE.3.4    Solve questions using models, simulations or data.
*Example:* Guide students to make a model of decomposition of plants and weathering rocks.

Benchmark Clarifications:
*Clarification 1:* Simulations include growth, human health, weather patterns, soil development and the butterfly life cycle.
*Clarification 2:* When solving questions, students may need to create a visual representation.

## Technological Impact Strand

### SC.2.TI.1 Identify technological progress.

SC.2.TI.1.1    Recognize that people use computing technology in the workplace or school to perform many important tasks and functions.
*Example:* Interview family members to determine how they use technology in their work environment.

Benchmark Clarifications:
*Clarification 1:* Instruction includes teacher explanations about how technology is used in the classroom.

| SC.2.TI.1.2 | Recognize that people use computing technology at home to perform many important tasks and functions. |
| --- | --- |

| SC.2.TI.1.3 | Identify and compare Artificial Intelligence (AI) devices to other devices. |
| --- | --- |

### SC.2.TI.2 Explain the consequences of using inaccurate information.

| SC.2.TI.2.1 | Evaluate if given information (written or visual) is accurate.<br>*Example:* Teacher shares an image of a jackalope and asks students to discuss if it is fake or not fake. |
| --- | --- |

Benchmark Clarifications:

*Clarification 1:* Instruction includes teaching that images can be digitally manipulated, and information can be falsified.

## Grade 3

### Communication and Collaboration Strand

*SC.3.CC.1 Assess how communication and collaboration are beneficial.*

SC.3.CC.1.1    Describe how collaborating with others can be beneficial to a project.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding how collaborating includes brainstorming or sharing ideas with one another.

SC.3.CC.1.2    Use feedback from peers to make revisions using technology.

Benchmark Clarifications:
*Clarification 1:* Instruction includes asking questions of self and others on their work.
*Clarification 2*: Feedback should be constructive.

SC.3.CC.1.3   Explain that searches may be enhanced by key terms.

> *Example:* Students use a shoe brand website to find a particular type of shoe, then they narrow their search by typing more descriptive words into the search bar like size and color. Finally, they add a sport to the search to see more specific results. Students compare the results from each search.

SC.3.CC.1.4   Describe how computer simulations can help communicate ideas in concepts or problem-solving.

> *Example:* Describe how a computer simulation can model the water cycle.

*SC.3.CC.2 Identify uses of technology and responsible uses of modern communication.*

SC.3.CC.2.1   Identify uses of technology when sending communication over the Internet.

Benchmark Clarifications:
*Clarification 1:* Instruction includes Netiquette depending on the audience and type of communication.
*Clarification 2*: Instruction includes email, texting, uploads, surveys and screen shots.

SC.3.CC.2.2  Describe responsible uses of modern communication media and devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes safe practices that include making sure your personal information is protected. Examples might be your information or your family's information, real names, addresses, phone numbers, credit card numbers and photographs.
*Clarification 2*: Instruction includes respecting the personal information of others.

## Personal Health and Safety Strand

### SC.3.HS.1 Determine safe and healthy Internet practices.

SC.3.HS.1.1  Discuss the need for parental control settings on network- capable devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes reasons that some sites and devices have parental control settings.

SC.3.HS.1.2  Discuss why some sites or games have age requirements.

*Example:* Johnny tries to get on a website to play a new video game. The website asks for his age. When he inputs his age, the website says that he is not allowed to enter. Discuss reasons his age would prevent him from playing the game.

Benchmark Clarifications:
*Clarification 1:* Instruction includes age ratings on games and videos, and age requirements to certain websites.

SC.3.HS.1.3  Explain what actions should be taken if students are either victims or witnesses of cyberbullying or harassment.

Benchmark Clarifications:
*Clarification 1:* Instruction includes providing information or evidence to authority figures or Fortify Florida to show authority figures, recordings, emails or photos.
*Clarification 2*: Students should understand that they should not engage with the cyberbully and block or mute all communication.

### SC.3.HS.2. Explain healthy digital practices.

SC.3.HS.2.1    Explore ways to balance movement and screen time.

Benchmark Clarifications:
*Clarification 1:* Instruction includes that for every 20 minutes of screen time, students look at an object 20 feet away for 20 seconds.
*Clarification 2:* Instruction includes identifying ways to incorporate physical movement.

SC.3.HS.2.2    Demonstrate the use of healthy digital habits.

### Computing Components Strand

### SC.3.CO.1 Differentiate and evaluate computer components.

SC.3.CO.1.1    Classify hardware as input, output, both or neither.

SC.3.CO.1.2    Use the keyboard of a computer to write short paragraphs or short stories.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the correct use of punctuation and capitalization.

SC.3.CO.1.3    Identify digital tools used for writing activities.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using digital tools such as word processing, emails and text messages.

SC.3.CO.1.4    Identify digital tools for data collection.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using digital tools such as tables, cameras and online forms or surveys.

SC.3.CO.1.5    Use digital tools for sharing information.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using digital tools such as slideshows, presentation software or storyboards.
*Clarification 2*: Instruction includes explaining why one might select that specific tool.

SC.3.CO.1.6    Apply self-editing practices to improve accuracy.

Benchmark Clarifications:
*Clarification 1:* Instruction includes accuracy within any activity, such as writing a prompt or creating a digital project.
*Clarification 2*: Instruction includes the use of built-in tools for grammar and spelling within software.

SC.3.CO.1.7    Categorize software based on its main purpose.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussion of different software products and their primary purpose.
*Clarification 2*: Instruction includes discussion of productivity, entertainment, communication, presentation, collaboration and organization.

SC.3.CO.1.8    Introduce how network systems are part of a global communication network.

Benchmark Clarifications:
*Clarification 1:* Instruction includes how anyone can access a website from anywhere at any time.

## Programming and Software Engineering Strand

### SC.3.PE.1 Explore coding concepts.

SC.3.PE.1.1    Explore using graphics, blocks or visual cues to design a program.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using graphics or visual cues to represent a list of directions.

SC.3.PE.1.2    Create a program that includes user choices based on defined conditions.

> *Example:* Create an algorithm that describes your daily routine for getting ready based on the weather.

### SC.3.PE.2 Organize types of data.

SC.3.PE.2.1    Collect data using a digital tool.

SC.3.PE.2.2    Compile data collected and draw conclusions based on trends.

Benchmark Clarifications:
*Clarification 1:* Instruction includes analyzing charts, graphs or tables to answer questions and draw conclusions.

SC.3.PE.2.3    Analyze data for trends.

### SC.3.PE.3 Develop problem-solving strategies.

SC.3.PE.3.1    Create a repeatable pattern to solve a problem.

SC.3.PE.3.2    Demonstrate how programs written differently can have the same outcome.

Benchmark Clarifications:
*Clarification 1:* Instruction includes identifying or explaining how multiple approaches can lead to a desired outcome or goal.

SC.3.PE.3.3    Use graphical programming or visual cues to represent a set of instructions (algorithm) that includes repetition.

   *Example:* Create an algorithm that describes your daily routine before you go to bed. Use words, phrases, pictures or symbols to create your algorithm.

SC.3.PE.3.4    Create a model or a simulation of a system and explain what the model shows.

   *Example:* Create a model that shows the role of water and nutrient transport within plants.

Benchmark Clarifications:
*Clarification 1:* Instruction includes models such as plant growth, solar systems and changes in matter.

SC.3.PE.3.5    Explain the process of sorting information into a useful order.

**Technological Impact Strand**

### SC.3.TI.1 Investigate periods of technological progress.

SC.3.TI.1.1    Summarize how different types of computing devices are used to communicate with others on a daily basis.

Benchmark Clarifications:
*Clarification 1:* Instruction includes devices such as cell phones, tablets and similar electronic communication devices.

SC.3.TI.1.2    Identify adaptive technology and discuss how it has changed over time.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that using adaptive technology can be a benefit to everyone.
*Clarification 2*: Adaptive technology includes screen readers, oversized keyboards, text-to-speech, highlighters, masking, subtitles, braille displays and language translators.
*Clarification 3*: Instruction includes discussing ways in which people with varying needs access adaptive technology.

SC.3.TI.1.3    Discuss the uses of Artificial Intelligence (AI) in daily life.

### SC.3.TI.2 Recognize the consequences of the misuse of Information.

SC.3.TI.2.1   Demonstrate awareness of copyright laws to show respect for the ideas of others when using digital artifacts.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that some digital artifacts are free to use while others are not.
*Clarification 2*: Instruction includes digital artifacts referring to text sources, images, videos and files.

SC.3.TI.2.2   Identify various digital artifacts and whether they are copyrighted or trademarked.

SC.3.TI.2.3   Cite evidence using direct and indirect citations.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using relevant textual evidence in written and oral communication.
*Clarification 2:* Instruction includes students naming the text or source.

SC.3.TI.2.4  Identify digital information resources used to answer research questions.

Benchmark Clarifications:
*Clarification 1:* Instruction includes resources such as online library catalog, encyclopedias, databases, search engines and websites.
*Clarification 2*: Instruction includes making sure that students are using reliable resources.

## Grade 4

### Communication and Collaboration Strand

**SC.4 CC.1 Demonstrate effective communication both individually and collaboratively.**

SC.4.CC.1.1   Demonstrate ways that technology can foster teamwork.

> *Example:* Students can collaborate on geometric software to explore angle measures.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing how technology can foster teamwork including shared documents, applications or presentations.

SC.4.CC.1.2   Demonstrate collaboration and problem-solving.

Benchmark Clarifications:
*Clarification 1:* Instruction includes collaborating with or without the use of technology.

SC.4.CC.1.3   Discuss ways that collaboration can lead to innovation.

> *Example:* Students can read a text about a recent innovation and then discuss ways that collaboration was essential to the innovation process.

SC.4.CC.1.4   Explain why providing and receiving feedback from others can improve performance for projects.

Benchmark Clarifications:
*Clarification 1:* Projects include ones completed both individually and collaboratively.

SC.4.CC.1.5   Compare different communication technologies.

**SC.4.CC.2 Evaluate digital information resources.**

SC.4.CC.2.1   Gather information from a variety of digital resources.

SC.4.CC.2.2   Organize information from digital resources.

## Personal Health and Safety Strand

### SC.4.HS.1. Practice safe and healthy Internet practices.

SC.4.HS.1.1    Discuss what makes websites and applications appropriate for use at school.

SC.4.HS.1.2    Discuss how websites and applications can be utilized for different purposes.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that websites and applications can foster one's education and personal growth.

SC.4.HS.1.3    Evaluate the permanence of content posted online.

SC.4.HS.1.4    Identify the legal and social consequences of cyberbullying.

### SC.4.HS.2. Explore the mental and physiological effects of digital device use.

SC.4.HS.2.1    Identify the impact of digital device usage on behavior.

## Computing Components Strand

### SC.4.CO.1 Introduce foundational computer literacy skills.

SC.4.CO.1.1    Demonstrate keyboarding skills for communication.

SC.4.CO.1.2    Create and edit multimedia artifacts using digital tools.

SC.4.CO.1.3    Publish multimedia artifacts using digital tools based on feedback.

Benchmark Clarifications:
*Clarification 1:* Publication includes various publications (local and online).
*Clarification 2*: Feedback can be from teacher or peers.

SC.4.CO.1.4    Determine whether software can be described as a system or application software.

Benchmark Clarifications:
*Clarification 1*: System software includes various operating systems while application software is what is used to perform tasks and solve problems.

SC.4.CO.1.5    Troubleshoot digital problems that may occur during daily use.

Benchmark Clarifications:
*Clarification 1:* Instruction includes common problems such as powering on devices, checking cable connections and checking settings.

SC.4.CO.1.6    Discuss ways computers connect.

Benchmark Clarifications:
*Clarification 1:* Ways that computers can connect include through USB, a wired network, wireless network and through Bluetooth.

SC.4.CO.1.7    Compare hardware and software.

Benchmark Clarifications:
*Clarification 1:* Instruction includes defining examples of hardware such as keyboard, laptop, tablet, mouse and monitors.
*Clarification 2:* Instruction includes defining examples of software such as applications, word processing programs, spreadsheets, presentation tools and electronic games.
*Clarification 3*: Instruction includes comparing similarities and differences of hardware and software.

### Programming and Software Engineering Strand

### *SC.4.PE.1 Explain the purpose of coding.*

SC.4.PE.1.1    Explain that when writing programs, a specific initial program environment is necessary.

> *Example:* If the game has a character, like a dog, who advances on the screen when it eats a bone, then the dog may need to go in another direction when it gets to the end of the screen.

Benchmark Clarifications:
*Clarification 1:* Initial program environment can include initial score, character position or program variables set to zero.
*Clarification 2:* Instruction includes activities that are digital or unplugged.

SC.4.PE.1.2    Create a condition that will modify a situation or value in the program.

> *Example:* Use tally marks in a game to designate points and add or subtract tally marks based on the given condition of the game.

Benchmark Clarifications:
*Clarification 1:* In programs that award points, points will not be less than zero.

### SC.4.PE.2 Classify visual representations of data.

SC.4.PE.2.1  Collect, organize and graph data.

*Example:* Survey the class to determine the median number of siblings in their house. Organize the data in a way that you can create a graphical representation of the data collected.

Benchmark Clarifications:
*Clarification 1:* The collection, organization and graphing of data can be done with and without the use of technology.
*Clarification 2*: Graphical representations are limited to tables, stem-and-leaf plots, line plots, bar graphs or pictographs.

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SC.4.PE.2.2  Analyze a graphical representation of data.

*Example:* When a student is analyzing a graph, they will reference the collected data.

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### SC.4.PE.3. Analyze problem-solving strategies.

SC.4.PE.3.1  Describe how computational thinking can be used to solve real-world issues in science and engineering.

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SC.4.PE.3.2  Create a list of steps (algorithm) to solve a real-world problem.

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### Technological Impact Strand

### SC.4.TI.1 Research a period of technological progress.

SC.4.TI.1.1  Explain how over time digital literacy has been used to simplify tasks and functions.

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SC.4.TI.1.2  Explore and identify the functions of adaptive technologies and how they have changed over time.

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SC.4.TI.1.3  Explain how Artificial Intelligence (AI) affects our ability to access, create and modify content.

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SC.4.TI.1.4  Compare human and computer performance on similar tasks.

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## SC.4.TI.2 Explain the consequences of the misuse of information.

SC.4.TI.2.1    Define plagiarism and explore the impacts of plagiarized materials.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the connection to text-based evidence.

## Grade 5

### Communication and Collaboration Strand

*SC.5 CC.1 Demonstrate effective communication.*

| | |
|---|---|
| SC.5.CC.1.1 | Identify appropriate and inappropriate uses of technology for communication with others. |
| SC.5.CC.1.2 | Demonstrate ways with or without technology that collaborating with others can support problem solving. |
| SC.5.CC.1.3 | Revise and refine thinking based on peer feedback. |

*SC.5.CC.2 Utilize information gathered using digital resources.*

| | |
|---|---|
| SC.5.CC.2.1 | Research and use information gathered from digital resources. |
| SC.5.CC.2.2 | Support ideas using collected evidence through research. |

### Personal Health and Safety Strand

*SC.5.HS.1. Implement safe and healthy Internet practices in-home or educational settings.*

| | |
|---|---|
| SC.5.HS.1.1 | Discuss the importance of a search engine's safe-search feature. |
| SC.5.HS.1.2 | Describe the role that parental digital monitoring programs play in Internet safety. |
| SC.5.HS.1.3 | Describe threats to safe and efficient use of electronic devices. |

**SC.5.HS.2.  *Discuss the mental and physiological effects of digital device use.***

SC.5.HS.2.1    Define the 20-20-20 rule for technology.

Benchmark Clarifications:
*Clarification 1:* For instruction of this benchmark, the 20-20-20 rule is defined as for every 20 minutes of screen time, look at an object 20 feet away for 20 seconds.

SC.5.HS.2.2    Discuss ways to counteract digital fatigue.

Benchmark Clarifications:
*Clarification 1:* Counteraction methods include blue light glasses, rest, digital detachment and more.

**SC.5.HS.3 *Discuss the impact of digital media and communication.***

SC.5.HS.3.1    Explain the impact of digital media, communication and the consequences of cyberbullying and harassment.

## Computing Components Strand

**SC.5.CO.1 *Apply foundational computer literacy skills.***

SC.5.CO.1.1    Describe the function and purpose of various input/output devices.

Benchmark Clarifications:
*Clarification 1:* Input devices include: keyboards, controllers, microphones and other devices.
*Clarification 2:* Output devices include: speakers, monitors, printers and other devices.

SC.5.CO.1.2    Create a digital project that answers a research question, clearly communicating thoughts and ideas.

Benchmark Clarifications:
*Clarification 1:* Instruction includes both collaboratively and independently.

SC.5.CO.1.3    Explore the use of keyboard shortcuts.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of an actual keyboard and a printed version of a keyboard.
*Clarification 2*: Instruction includes the understanding that not all computers have the same shortcuts.
*Clarification 3*: Shortcut functions include copy, paste, cut, print, select all, zoom in and out, underline, bold, italics, find and undo.

SC.5.CO.1.4    Explore the use of the keyboard with proper finger placement for all rows.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of an actual keyboard and a printed version of a keyboard.

SC.5.CO.1.5    Explain how computers access a network and how to effectively troubleshoot.

SC.5.CO.1.6    Explain how computers can communicate to transfer data.

### SC.5.CO.2 Introduce the concept of hardware components.

SC.5.CO.2.1    Identify hardware components in the computation cycle as input, processing, output and storage.

> *Example:* As Oscar is playing a game he saved from the previous day, he steers his car with the remote control. He could see the car turn on the screen, but he crashed into the wall and his remote vibrated. Identify the input devices and the output devices. What system components are saving his game and processing information while he plays?

Benchmark Clarifications:
*Clarification 1:* Instruction includes what system components have one purpose or multiple purposes such as input, output, storage and processing.

SC.5.CO.2.2    Troubleshoot hardware problems that may occur during everyday use.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, common problems include powering on devices, checking cable connections and checking settings.

**SC.5.CO.3 Introduce the concept of software components.**

SC.5.CO.3.1    Identify software components in the computation cycle as input, processing, output and storage.

SC.5.CO.3.2    Troubleshoot software problems that may occur during everyday use.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, common tasks include refreshing the screen, closing out and reopening the application, completely rebooting, checking compatibility and updating software.

## Programming and Software Engineering Strand

**SC.5.PE.1 Investigate the uses of computer programs.**

SC.5.PE.1.1   Explain how computers model intelligent behavior.

SC.5.PE.1.2   Create a program in a graphical environment.

Benchmark Clarifications:
*Clarification 1:* Graphical environments include block-based and visual coding environments.

SC.5.PE.1.3   Create a program using arithmetic operators, conditionals and repetition in programs.

SC.5.PE.1.4   Detect and correct program errors.

**SC.5.PE.2 Interpret visual representations of data.**

SC.5.PE.2.1   Describe examples of databases from everyday life.

Benchmark Clarifications:
*Clarification 1:* Instruction includes: barcode categories, school records, telephone directories and contact lists.

SC.5.PE.2.2   Identify data types and data structures.

SC.5.PE.2.3   Analyze the data from a given scenario.

> *Example:* Kysha observed the moon for a month and kept a journal describing the moon, including its apparent shape and size. She will analyze her journal to draw conclusions about the moon for that month.
>
> *Example:* Courtney's class has conducted an experiment tracking the spread of Virginia creeper. Students will collect the data and then analyze the data for the spread to create a hypothesis about the plant's growth.

Benchmark Clarifications:
*Clarification 1:* Scenarios should make the connection to science or math.

### SC.5.PE.3 Demonstrate problem-solving strategies.

SC.5.PE.3.1   Identify the concepts illustrated by a simulation that offers problems and solutions.

Benchmark Clarifications:
*Clarification 1:* Instruction includes simulations such as ecosystem, predator/prey and invasive species.

SC.5.PE.3.2   Solve problems using digital graphic organizers.

Benchmark Clarifications:
*Clarification 1:* Instruction includes concept maps and Venn diagrams.

SC.5.PE.3.3   Explain that there are several possible algorithms for searching within a dataset.

Benchmark Clarifications:
*Clarification 1:* Possible algorithms could be a specific word in a word list or a card in a deck of cards.

SC.5.PE.3.4   Explain how to identify and correct logical errors in algorithms.

Benchmark Clarifications:
*Clarification 1:* Logical errors include written, mapped live action or digital.

## Technological Impact Strand

### SC.5.TI.1 Present periods of technological progress.

SC.5.TI.1.1  Explain how access to technology helps empower individuals and groups.

Benchmark Clarifications:
*Clarification 1:* Empowerment includes access to information, worldwide communication and e-commerce.

SC.5.TI.1.2  Explore various technology-related career paths.

SC.5.TI.1.3  Evaluate audio and video technologies and their impact on communication.

### SC.5.TI.2. Demonstrate ways to avoid the misuse of information.

SC.5.TI.2.1   Compare digital resources.

Benchmark Clarifications:
*Clarification 1:* Comparisons include accuracy, relevancy and appropriateness.

SC.5.TI.2.2   Describe the purpose of copyright.

Benchmark Clarifications:
*Clarification 1:* Instruction includes recognizing the symbol that represents copyright.

SC.5.TI.2.3   Describe the possible consequences for improper use of digital materials that are protected by copyright.

SC.5.TI.2.4   Verify information from digital resources.

Benchmark Clarifications:
*Clarification 1:* Instruction includes verifying information from research conducted independently.

SC.5.TI.2.5   Demonstrate how to cite sources.

**Computer Science 6-8**

## Grade 6

### Communication and Collaboration Strand

*SC.6 CC.1 Apply effective communication digitally.*

SC.6.CC.1.1   Demonstrate an ability to communicate through various online tools.

*SC.6.CC.2 Apply information collected using digital resources.*

SC.6.CC.2.1   Create a digital product individually and collaboratively.

Benchmark Clarifications:
*Clarification 1:* When creating a product, students should be able to design and publish the product.
*Clarification 2:* Products include those that can inform, persuade or entertain.

### Personal Health and Safety Strand

*SC.6.HS.1. Explore safe Internet practices.*

SC.6.HS.1.1   Identify the connection between strong passwords and Internet safety.

SC.6.HS.1.2   Discuss the need for downloads to come from trusted sources.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on a source's legitimacy.

SC.6.HS.1.3   Describe safe practices when participating in digital communication.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on communications within discussion groups and blogs.

SC.6.HS.1.4   Evaluate a given website to determine if it is safe for users.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the accuracy and security of given websites.
*Clarification 2*: Instruction includes types of personal information required for access and whether it is encrypted (https).

### SC.6.HS.2.  Investigate the mental and physiological effects of digital device use.

SC.6.HS.2.1    Define the online disinhibition effect.

SC.6.HS.2.2    List negative impacts of excessive device usage.

Benchmark Clarifications:
*Clarification 1:* Instruction includes device addiction, online versus in-person personality traits, digital overload and others.

SC.6.HS.2.3     Implement the 20-20-20 rule for technology.

Benchmark Clarifications:
*Clarification 1:* For instruction of this benchmark, the 20-20-20 rule is defined as for every 20 minutes of screen time, look at an object 20 feet away for 20 seconds.

### SC.6.HS.3 Explore the impact of digital footprints.

SC.6.HS.3.1    Explore the impact that digital media and communication has on our behavior.

Benchmark Clarifications:
*Clarification 1:* Instruction includes identifying impacts of computing, social networking and web technologies on an individual and society.

### Computing Components Strand

### SC.6.CO.1 Implement foundational computer literacy fluency.

SC.6.CO.1.1    Identify multiple file format types.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, file types include formats for word processing, images, music and three-dimensional drawings.
*Clarification 2:* Instruction includes explaining why different file types exist.

SC.6.CO.1.2    Identify applications that have different desktop and online versions.

Benchmark Clarifications:
*Clarification 1:* Instruction includes desktop versions and online subscription services.

SC.6.CO.1.3    Identify the differences between wired and wireless computer networks.

SC.6.CO.1.4    Describe how information is translated and communicated between computers and devices over a network.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on both text and non-text information.

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SC.6.CO.1.5    Explain that a database is a collection of digital data that can be organized, stored and retrieved in a designated order.

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SC.6.CO.1.6    Research questions using digital information resources.

Benchmark Clarifications:
*Clarification 1:* Research questions should make connections to scientific and statistical questions within this grade level.

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### SC.6.CO.2. Evaluate hardware components.

SC.6.CO.2.1    Identify and describe the major hardware components and functions of computer systems.

Benchmark Clarifications:
*Clarification 1:* Major hardware components include motherboards, processors, hard drives, random access memory (RAM) and cooling fans.

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### SC.6.CO.3. Evaluate software components.

SC.6.CO.3.1    Describe the essential characteristics of a software artifact.

Benchmark Clarifications:
*Clarification 1:* Essential characteristics include usability, completeness and accuracy.
*Clarification 2*: Instruction includes evaluating the effective use of a given program.

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SC.6.CO.3.2    Describe the main functions of an operating system.

Benchmark Clarifications:
*Clarification 1:* Functions include user interface, input and output (IO), device management and task management.

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SC.6.CO.3.3    Explain how an operating system provides user and system services.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing how an operating system manages the computer hardware and software.

SC.6.CO.3.4    Describe the major software components and functions of computer systems.

Benchmark Clarifications:
*Clarification 1:* Major software components include operating system, application programs, graphics, firmware and others.

SC.6.CO.3.5    Evaluate various forms of input and output (IO) and peripheral devices.

Benchmark Clarifications:
*Clarification 1:* Input and output and peripheral devices include monitor, mouse, printer, keyboard, headphone, speakers and microphone.

## Programming and Software Engineering Strand

### SC.6.PE.1 Develop code segments to solve a problem.

SC.6.PE.1.1    Identify the types of operations that can be performed on different data types.

Benchmark Clarifications:
*Clarification 1:* Operations include arithmetic operations and logical operations.

SC.6.PE.1.2    Develop a program using a string data type.

SC.6.PE.1.3    Develop a program using a numeric data type.

Benchmark Clarifications:
*Clarification 1:* Instruction includes integers and floats.

SC.6.PE.1.4    Index selected items within a list.

Benchmark Clarifications:
*Clarification 1:* Instruction includes indexing items from a list in a spreadsheet, array list or programming language.

SC.6.PE.1.5    Compare data types and their uses.

SC.6.PE.1.6    Develop a program using a Boolean data type.

Benchmark Clarifications:
*Clarification 1:* Boolean data types include true or false; yes or no; on or off; and 1 or 0.

SC.6.PE.1.7    Write code segments that use standard mathematical operators.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of addition, subtraction, multiplication and division.
*Clarification 2:* Within this benchmark, instruction includes the use of inequalities.

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SC.6.PE.1.8    Use a function for a specified purpose.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the term function and procedure can be used interchangeably.
*Clarification 2*: Instruction includes consideration of the intake and output of information.

---

SC.6.PE.1.9    Use looping techniques for a specified purpose.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the terms iteration and loop will be used interchangeably.

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SC.6.PE.1.10   Use conditional statements for a specified purpose.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the term selection and conditional statement will be used interchangeably.

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SC.6.PE.1.11   Design solutions that use repetition and two-way selection.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark two-way selections include while, for and if/else statements.

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### SC.6.PE.2 Create visual representations of data.

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SC.6.PE.2.1     Create designated graph types using data.

Benchmark Clarifications:
*Clarification 1:* Graph types include graphs, charts, tables and Venn diagram.

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SC.6.PE.2.2     Analyze a database and propose solutions based on a task or problem.

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SC.6.PE.2.3     Create a simple database.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the expectation is that a simple database includes defining field formats, adding new records or manipulating data.

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### SC.6.PE.3 Relate problem-solving strategies to computational thinking.

SC.6.PE.3.1     Identify what kinds of real-world problems can be solved using modeling and simulation.

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SC.6.PE.3.2     Interact with content-specific models and simulations to support learning, research and problem-solving.

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SC.6.PE.3.3     Design a digital model.

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SC.6.PE.3.4     Identify the benefits and the limitations of the use of models.

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SC.6.PE.3.5     Create a visual representation of a solution to a problem.

Benchmark Clarifications:
*Clarification 1:* Instruction includes visually writing out a program plan.

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SC.6.PE.3.6     Evaluate the logical flow of a step-by-step program by acting it out through computer-free activities.

Benchmark Clarifications:
*Clarification 1:* Instruction includes drafting a flowchart.

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SC.6.PE.3.7     Select tools and technology resources to accomplish a variety of tasks and solve problems.

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### SC.6.PE.4 Define the software development life cycle.

SC.6.PE.4.1     Recognize the phases of the software development life cycle.

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## Technological Impact Strand

### SC.6.TI.1 Research technology innovations.

SC.6.TI.1.1    Recognize the data content sources that make your digital footprint.

Benchmark Clarifications:
*Clarification 1:* Instruction includes permanence of digital footprint.
*Clarification 2:* Within this benchmark, digital footprint includes digital profiles and other forms of personally identifiable information (PII).

SC.6.TI.1.2    Explore the history of computer and other devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes legacy devices and antiquated technology.

SC.6.TI.1.3    Create a timeline for the innovation of an electronic device.

SC.6.TI.1.4    Describe various technology-related career paths.

### SC.6.TI.2. Introduce the regulations surrounding the use of information.

SC.6.TI.2.1    Recognize the consequences of plagiarism on the development of creative works.

Benchmark Clarifications:
*Clarification 1:* Creative works include projects, publications and online content.
*Clarification 2*: Instruction includes defining intellectual property.

SC.6.TI.2.2    Demonstrate compliance with the school's Acceptable Use Policy.

SC.6.TI.2.3    Explain fair use for using copyrighted materials.

Benchmark Clarifications:
*Clarification 1:* Copyrighted materials include images, music, video and text.

SC.6.TI.2.4    Generate citations for text and non-text sources using a digital tool.

## Emerging Technology Strand

### SC.6.ET.1. Identify emerging technologies.

SC.6.ET.1.1    Identify technology used to support specialized forms of human-computer interaction (HCI).

Benchmark Clarifications:
*Clarification 1:* Technologies may include augmented reality (AR), virtual reality (VR) and others.

SC.6.ET.1.2    Identify technology skills needed in the workplace.

### SC.6.ET.2. Identify Artificial Intelligence (AI) and its applications.

SC.6.ET.2.1    Identify the characteristics of Artificial Intelligence (AI).

SC.6.ET.2.2    Discuss the benefits associated with Artificial Intelligence (AI).

### SC.6.ET.3. Identify characteristics of robotics.

SC.6.ET.3.1    Explain why some tasks can be accomplished faster by computers.

SC.6.ET.3.2    Describe how humans and machines interact to accomplish tasks that neither can accomplish alone.

## Cyber Security Strand

### SC.6.CS.1. Explore the physical security of devices.

SC.6.CS.1.1    Define the states of data.

Benchmark Clarifications:
*Clarification 1:* States of data include data at rest, data in motion and data in use.

SC.6.CS.1.2    Illustrate the concept of access control and how to limit access to authorized users.

SC.6.CS.1.3    Discuss the importance of cybersecurity.

SC.6.CS.1.4    Determine information that should remain confidential.

SC.6.CS.1.5    Identify the need for encryption.

SC.6.CS.1.6    Recognize the importance of digital identity.

### *SC.6.CS.2 Explore network security concepts.*

SC.6.CS.2.1    Identify the need for security safeguards on personal devices.

## Grade 7

### Communication and Collaboration Strand

*SC.7 CC.1 Demonstrate the understanding of collaborative tools.*

SC.7.CC.1.1    Apply multimedia tools for local and global group collaboration.

Benchmark Clarifications:
*Clarification 1:* Tools include collaborative spreadsheets, video conferencing software, collaborative forms, image editing software and other programs.

SC.7.CC.1.2    Identify productivity tools for collaboration.

Benchmark Clarifications:
*Clarification 1:* Instruction includes shared calendars, group messaging applications and other project management software.

SC.7.CC.1.3    Identify individual roles within a collaborative team.

*SC.7.CC.2 Synthesize information to create unique artifacts.*

SC.7.CC.2.1    Organize compiled information using a digital tool.

SC.7.CC.2.2    Analyze one's own ideas with research-based information to create a unique digital artifact.

### Personal Health and Safety Strand

*SC.7.HS.1. Analyze Internet practices.*

SC.7.HS.1.1    Explain the possible consequences of cyberbullying.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the consequences that our society and schools might impose.

SC.7.HS.1.2    Discuss the impact of online disinhibition on individuals and society.

SC.7.HS.1.3    Interpret writings and communications using terminology.

SC.7.HS.1.4    Categorize potential dangers to an individual's safety and security.

> *Example:* Create a graphic organizer to sort information security, network security and physical security into categories.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of email, chat rooms and other forms of direct electronic communication.
*Clarification 2:* Within this benchmark, dangers include predatory behavior and human trafficking on the Internet.

SC.7.HS.1.5    Recognize the importance of reporting suspicious behavior encountered on the Internet.

SC.7.HS.1.6    Compare the risks and benefits of accessing the Internet.

Benchmark Clarifications:
*Clarification 1:* Instruction includes access to websites, web applications or software that does not protect against the disclosure, use or dissemination of an individual's personal information.

SC.7.HS.1.7    Examine safe practices for technology use.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing personal information security.
*Clarification 2:* Instruction includes discussing personal safety when utilizing technology.

### SC.7.HS.2.  Explain the mental and physiological effects of digital device use.

SC.7.HS.2.1    Identify the digital practices that may affect your physical and mental well-being.

### SC.7.HS.3. Discuss the impact of digital footprints.

SC.7.HS.3.1    Discuss how device usage can affect sleeping patterns.

SC.7.HS.3.2    Discuss the potential risks of device addiction and how to prevent it.

SC.7.HS.3.3    Explain the possible consequences of cyberbullying and inappropriate use of digital media and communication on personal life and society.

**Computing Components Strand**

### SC.7.CO.1 Develop foundational computer literacy fluency.

SC.7.CO.1.1    Identify the kinds of content associated with different file types.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, file types include .mp3's association with audio, .mp4's association with video and various file types associated with digital documents.

SC.7.CO.1.2    Differentiate between different file types.

> *Example*: Lukas is working on a resume to apply for a job at his local grocery store. The grocery store just adopted an all-digital application process. Identify what file type would be best for his virtual resume and why.

Benchmark Clarifications:
*Clarification 1:* Instruction includes researching different types of documents such as .docx, .pdf, .stl, .jpg and others.

SC.7.CO.1.3    Describe the relationship between hardware and software.

Benchmark Clarifications:
*Clarification 1:* Hardware and software including basic input/output systems (BIOS), operating systems and firmware.

SC.7.CO.1.4    Utilize a set of websites to find information for a given topic.

SC.7.CO.1.5    Utilize government websites to facilitate civic engagement.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, students will access local, state and federal government websites.

SC.7.CO.1.6    Describe strategies for determining the reliability of resources or information on the Internet.

### SC.7 CO.2 Draw connections between hardware components.

SC.7.CO.2.1    Explain the difference between wired, local area, wireless and mobile networks.

SC.7.CO.2.2    Identify and describe the function of the main internal parts of a basic computing device.

Benchmark Clarifications:
*Clarification 1:* Instruction includes motherboard, hard drive, central processing unit (CPU), random access memory (RAM), graphics processing unit (GPU) and other components.

SC.7.CO.2.3    Explore devices that contain firmware.

Benchmark Clarifications:
*Clarification 1:* Instruction includes defining firmware and exploring the importance of it.

SC.7.CO.2.4    Explain the connection of natural resources on the manufacturing of computer hardware components.

### *SC.7 CO.3 Draw connections between software components.*

SC.7.CO.3.1    Differentiate between desktop applications and software as a service (SaaS).

Benchmark Clarifications:
*Clarification 1:* Instruction includes programs that have an online counterpart with varying functionality.

### Programming and Software Engineering Strand

### *SC.7.PE.1 Construct coding segments for a purpose.*

SC.7.PE.1.1    Create a function for a specific purpose.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing why a program should be program specific rather than generic.

SC.7.PE.1.2    Write a code segment that will explore a list using iteration.

SC.7.PE.1.3    Develop a logical expression using operator precedence.

Benchmark Clarifications:
*Clarification 1:* Problem types include equations that include parenthesis but not nested parentheses.
*Clarification 2:* Instruction focuses on the connection between properties of equality and order of operations.

SC.7.PE.1.4    Develop an arithmetic expression using operator precedence.

Benchmark Clarifications:
*Clarification 1:* Problem types include equations that include parenthesis but not nested parentheses.
*Clarification 2*: Instruction focuses on the connection between properties of equality and order of operations.

SC.7.PE.1.5    Identify the types and uses of variables in a program.

Benchmark Clarifications:
*Clarification 1:* Instruction includes explaining the use of variables in a program.
*Clarification 2*: Instruction includes demonstrating how different data types are defined in variables within a given program.

SC.7.PE.1.6    Develop problem solutions using a block programming language.

Benchmark Clarifications:
*Clarification 1:* Block programming language includes looping behavior, conditional statements, expressions, variables and functions.

SC.7.PE.1.7    Create online content using advanced design tools.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, online content includes webpages, digital portfolios and multimedia artifacts.

SC.7.PE.1.8    Identify different types of programming errors.

Benchmark Clarifications:
*Clarification 1:* Types of programming errors include syntax, logical and runtime.

SC.7.PE.1.9    Debug a program using iterative development.

*Example:* How is the iterative development of a computer program and an essay alike and different?
*Example:* Create a series of steps that you can repeat over and over to help find errors in a computer program.

SC.7.PE.1.10   Write a code segment that will explore a list using iteration.

SC.7.PE.1.11   Create iterative and non-iterative structures in a code segment.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the Fibonacci sequence.

### SC.7.PE.2 Use data to make predictions.

SC.7.PE.2.1   Predict outputs while showing an understanding of inputs.

SC.7.PE.2.2   Analyze digital data within a database.

Benchmark Clarifications:
*Clarification 1:* Instruction includes generating graphs, generating reports and structuring data.

### SC.7.PE.3 Apply computational thinking to programming.

SC.7.PE.3.1   Define parameters for individual and collaborative projects using Boolean logic.

Benchmark Clarifications:
*Clarification 1:* Boolean logic includes "and," "or" and "not."

SC.7.PE.3.2   Modify and create a simulation to analyze and illustrate a concept in depth.

SC.7.PE.3.3   Use modeling and simulations to test scientific hypotheses.

SC.7.PE.3.4   Define the concept of a class related to object-oriented programming.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that in object-oriented programming, a class is the outline for objects or attributes.

SC.7.PE.3.5   Identify the purpose of indexing the order of elements in a list.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the potential of different programming languages indexing differently.

SC.7.PE.3.6    Perform program tracing to predict the behavior of programs.

   *Example:* Students received a program to randomize passwords. The students must read through the program and interpret the logic for each section of the program and write them out in their own words predicting what each section will do.

SC.7.PE.3.7    Identify the types and uses of variables in a program.

### SC.7.PE.4 Explain the phases of the software development life cycle.

SC.7.PE.4.1    Define the phases of the software development life cycle.

## Technological Impact Strand

### SC.7.TI.1 Research the relationship between consumerism and technological advancements.

SC.7.TI.1.1    Discuss the ways that technology has increased the capacity for communication within a community.

SC.7.TI.1.2    Evaluate the responsible and irresponsible use of information on collaborative projects.

SC.7.TI.1.3    Identify how media is used to influence information.

SC.7.TI.1.4    Analyze technology-related career paths.

SC.7.TI.1.5    Summarize the historical impact of digital media and communication.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the historical purposes of digital media and communication.

SC.7.TI.1.6    Explore the innovation of computer components.

**SC.7.TI.2 *Recognize the regulations surrounding the use of information.***

SC.7.TI.2.1    Describe legal and ethical behaviors when using information and technology and describe the consequences of misuse.

SC.7.TI.2.2    Describe and model responsible use of modern communication media and devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussion of personal information security.

SC.7.TI.2.3    Recognize the legal use of modern communication media and devices.

SC.7.TI.2.4    Explore the ethical use of collected data.

SC.7.TI.2.5    Explain how copyright law and licensing protect the owner of intellectual property.

## Emerging Technologies Strand

**SC.7. ET.1. *Recognize emerging technologies that impact daily life.***

SC.7.ET.1.1    Investigate the latest technologies and the potential they have to improve our lives at home, work and in society.

SC.7.ET.1.2    Explore emerging technologies that have the potential to impact education.

**SC.7. ET.2. *Recognize Artificial Intelligence (AI) and its applications.***

SC.7.ET.2.1    Explore future technologies and the role artificial intelligence (AI) may play.

**SC.7. ET.3. *Recognize characteristics of robotics.***

SC.7.ET.3.1    Describe ways in which adaptive technologies can assist users in their daily lives.

SC.7.ET.3.2    Identify ways humans interact with computers.

Benchmark Clarifications:
*Clarification 1:* Instruction includes software and user interface.

SC.7.ET.3.3    Identify ways humans interact with hardware components.

Benchmark Clarifications:
*Clarification 1:* Instruction includes probes, sensors and handheld devices.

## Cyber Security Strand

### SC.7.CS.1. Describe the physical security of devices.

SC.7.CS.1.1    Describe data in its three states and potential threats to each state.

Benchmark Clarifications:
*Clarification 1:* The three states of data are data in use, data at rest and data in motion.

SC.7.CS.1.2    Explain the concept of access control and how to limit access to authorized users.

Benchmark Clarifications:
*Clarification 1:* Students should examine more advanced authentication and authorization methods, such as two-factor, multifactor and biometric.

SC.7.CS.1.3    Examine the basics of cybersecurity needs for business, government and organizations.

SC.7.CS.1.4    List and define the elements of the confidentiality, integrity and availability (CIA) triad.

SC.7.CS.1.5    Explain components of access control.

Benchmark Clarifications:
*Clarification 1:* Components of access control include identification, authentication, authorization, accountability and non-repudiation.

SC.7.CS.1.6    Identify the characteristics of strong versus weak passwords in data and identity security.

SC.7.CS.1.7    Explain the proper use and operation of security technologies.

SC.7.CS.1.8    Identify actions that protect electronic devices.

Benchmark Clarifications:
*Clarification 1:* Actions include protecting devices from viruses, intrusion, vandalism and other malicious activities.

### SC.7.CS.2 Investigate the interactions of network devices.

SC.7.CS.2.1    Define the Internet of Things (IoT).

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that IoT is a network of devices, normally physical objects with sensors, that exchange information and data with one another and to computing systems.

### SC.7.CS.3 Explore the attributes of social engineering.

SC.7.CS.3.1    Identify the types of cyberattacks.

SC.7.CS.3.2    Explore social engineering attacks.

SC.7.CS.3.3    Identify data vulnerabilities.

Benchmark Clarifications:
*Clarification 1:* Instruction includes password strength (alphanumeric passwords), biometric access and two-factor authentication.
*Clarification 2*: Within this benchmark, encryptions include cryptography, Ceasar cypher, MD5 hashing and Vigenère cypher.

# Grade 8

## Communciation and Collaboration Strand

### SC.8 CC.1 Create a collaborative communication process.

SC.8.CC.1.1    Design a digital product.

Benchmark Clarifications:
*Clarification 1*: Instruction includes creating a product pertaining to the real world using a variety of digital tools and resources.
*Clarification 2:* Instruction includes the creation of a digital product that provides value to society individually or collaboratively.

SC.8.CC.1.2    Evaluate the benefits of collaboration compared to individual product creation.

Benchmark Clarifications:
*Clarification 1*: Instruction includes circumstances in which working as a collaborative group would not be optimal or possible.

### SC.8.CC.2 Create artifacts using the collaborative process.

SC.8.CC.2.1    Publish a digital product individually and collaboratively.

Benchmark Clarifications:
*Clarification 1:* Instruction includes creating a product pertaining to the real- world, using a variety of digital tools and resources.
*Clarification 2:* Instruction includes publication of a digital product that provides value to society individually or collaboratively.
*Clarification 3*: Instruction includes reflecting on the individual and collaborative process.

## Personal Health and Safety Strand

### SC.8.HS.1 Implement safe and healthy Internet practices.

SC.8.HS.1.1    Describe the impacts of the presence of technology and the lack of technology on everyday life.

Benchmark Clarifications:
*Clarification 1:* Instruction includes comparing how the presence of technology has impacted our daily lives and how the lack of technology has impacted our daily lives.

SC.8.HS.1.2    Develop procedures to protect personal information while accessing the Internet.

Benchmark Clarifications:
*Clarification 1*: Instruction includes access to websites, web applications or software that does not protect against the disclosure, use or dissemination of an individual's personal information.
*Clarification 2*: Instruction includes theft of personal data including social security numbers, banking information and identity.

SC.8.HS.1.3    Model a procedure to mitigate risks to personal safety while accessing the Internet.

> *Example*: Jennifer is playing a game online competing against other players. Her opponent has messaged within the game to ask her where she is from and how old she is. Develop procedures that would mitigate risks for Jennifer's personal safety.

Benchmark Clarifications:
*Clarification 1*: Instruction focuses on knowledge of location and personal privacy.

### SC.8.HS.2 Analyze the mental and physiological effects of digital device use.

SC.8.HS.2.1    Determine the association between hand-eye coordination and the use of digital devices.

SC.8.HS.2.2    Investigate the causes of headaches associated with digital device usage.

Benchmark Clarifications:
*Clarification 1*: Within this benchmark, causes include but are not limited to poor posture, dehydration, blue light and eye strain.

SC.8.HS.2.3    Investigate the causes of physical body changes due to device usage.

Benchmark Clarifications:
*Clarification 1*: Focal points include research on muscle, nervous and bone systems.
Clarification 2: Instruction is limited to the physical effects of direct digital device usage.

SC.8.HS.2.4    Identify the effects on cognitive function as a result of technology use.

### SC.8.HS.3 Analyze the impact of digital footprints.

SC.8.HS.3.1    Discuss how regulating the use of digital media and communication is important for mental and physical well-being.

SC.8.HS.3.2   Analyze how digital media and communication influence behavior.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the influences on individuals, communities and cultures.

## Computing Components Strand

### SC.8.CO.1 Demonstrate foundational computer literacy fluency.

SC.8.CO.1.1   Integrate information from multiple file formats into a single artifact.

SC.8.CO.1.2   Create a collaborative project utilizing an online digital application.

Benchmark Clarifications:
*Clarification 1:* Projects include those that inform, persuade and entertain others.

### SC.8.CO.2 Explore hardware compatibility requirements.

SC.8.CO.2.1   Explain how to disassemble or reassemble a desktop computer.

SC.8.CO.2.2   Explore different hardware specifications and their impact on the performance of the computer.

Benchmark Clarifications:
*Clarification 1:* Instruction includes multicore processing, refresh rates and their impact on operation.

SC.8.CO.2.3   Identify the major components of a network.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the components include connection, connecting point and other devices to communicate with.

### SC.8.CO.3 Explore software compatibility requirements.

SC.8.CO.3.1   Compare the benefits and limitations of desktop applications and their complimentary online subscription version.

**Programming and Software Engineering Strand**

### SC.8.PE.1 Utilize coding segments for a purpose.

SC.8.PE.1.1    Use an expression for a specified purpose.

*Example:* Simon has been asked to develop a rock/paper/scissors game. He assigns rock as the number 1, paper as the number 2 and scissors as the number 3. Develop expressions that will allow the game to output a winner based off the combination of user and computer selections.

SC.8.PE.1.2    Create a programming process for decomposing a problem.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the term function and procedure can be used interchangeably.
*Clarification 2*: Instruction includes consideration of the intake and output of information.

SC.8.PE.1.3    Create a function with parameters.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that a parameter is a kind of variable that is defined in the function.

SC.8.PE.1.4    Explain the use of iterative and non-iterative structures and their uses as a code segment.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing that iteration is a process repeated until a specific end result.

SC.8.PE.1.5    Create an algorithm to solve one or more parts of a decomposed problem.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on creating algorithms that are efficient, reliable and valid.
*Clarification 2:* Context for problems include video games, robot obstacle course and making dinner.

SC.8.PE.1.6    Create an algorithm that can collect data.

SC.8.PE.1.7    Design an application for a specified purpose.

*Example:* A marine biologist conducting research at the FSU Coastal and Marine Laboratory is trying to determine why periwinkle snails climb to the top of marsh seagrass. Design a program to determine the time of day that the majority of snails climb the seagrass. Analyze the data to determine what events cause the snails to climb at that certain time.

SC.8.PE.1.8    Recognize different numerical data types.

Benchmark Clarifications:
*Clarification 1:* Instruction includes decimal type (floating point) and integers.

SC.8.PE.1.9    Design a program that will assist a user with equations using standard mathematical operators.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of addition, subtraction, multiplication and division.
*Clarification 2*: Within this benchmark, instruction includes the use of inequalities.
*Clarification 3*: Instruction includes flowcharting the initial sequence of steps.

SC.8.PE.1.10   Create a code segment using iteration.

SC.8.PE.1.11   Identify the limitations that need to be recognized when creating an algorithm.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the necessity to abide by mathematical rules.

SC.8.PE.1.12   Select an efficient algorithm for a given task based on certain criteria.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the expectation is that students will not create algorithms, a list will be provided by the teacher.
*Clarification 2*: Criteria may include time, resources and accessibility.

### SC.8.PE.2 Create and analyze data to solve problems.

SC.8.PE.2.1    Select and use applicable data-collection technology.

Benchmark Clarifications:
*Clarification 1:* Instruction includes gathering, viewing, organizing and analyzing data.
*Clarification 2:* Data-collection tools include probes, handheld devices, geographic mapping systems and output from multiple runs of a computer program.

SC.8.PE.2.2     Utilize data-collection technology to report results for content-related problems.

Benchmark Clarifications:
*Clarification 1:* Instruction includes allowing students to operate individually and collaboratively.

SC.8.PE.2.3     Utilize data from simulations to test hypotheses.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the use of digital modeling.

SC.8.PE.2.4     Perform a variety of operations such as sorting, filtering and searching in a database.

SC.8.PE.2.5     Utilize organized data within a database to solve a problem.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the selection and display of the data using an appropriate graph.

### *SC.8.PE.3 Apply computational thinking to scenario-based problems.*

SC.8.PE.3.1     Represent natural phenomena using a model.

SC.8.PE.3.2     Explore the purpose of a class.

Benchmark Clarifications:
*Clarification 1*: Instruction includes understanding that classes can be used to create new objects when programming.

SC.8.PE.3.3     Evaluate the benefits and limitations of the use of models.

> *Example*: Mrs. Hooper's class is studying the effects of erosion on the Florida Gulf coastline. Her class is located in Duval County and is not adjacent to the Gulf coast. Evaluate the benefits and limitations of developing a model to simulate the effects of erosion on the Gulf Coast of Florida.

Benchmark Clarifications:
*Clarification 1*: Instruction includes consideration of models.
*Clarification 2*: Within this benchmark, instruction includes consideration of safety, cost, time, location and precision.

### SC.8.PE.4 Analyze the software development life cycle.

SC.8.PE.4.1    Explore the purpose of the software development life cycle.

SC.8.PE.4.2    Explain the phases of a simple software development life cycle.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the following phases: describe the project, list necessary steps, take resources into consideration, create a visual representation, actualize the code then perform maintenance for needed changes.

SC.8.PE.4.3    Discuss the role of maintenance in the software development cycle.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the outcome of changing, modifying and improving the project to meet the user's needs.

## Technological Impact Strand

### SC.8.TI.1 Examine the causes, course and consequences of technological advancements.

SC.8.TI.1.1    Examine the historical progression and impact of digital media and communication.

Benchmark Clarifications:
*Clarification 1:* Instruction includes how digital media and communication has changed over time.
Clarification 2: Instruction includes physical meeting places prior to the popularity of the Internet.

SC.8.TI.1.2    Describe the influence of access-to-information technologies over time.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the effects of information technology on the workplace, education and global society.
*Clarification 2*: Instruction includes the historical impact.

### SC.8.TI.2 Investigate tools and methods used for regulatory compliance.

SC.8.TI.2.1    Describe legal and ethical behaviors when using technology.

SC.8.TI.2.2      Use a local or federal government website to engage with a public official.

SC.8.TI.2.3      Compare various technology-related career paths.

### Emerging Technologies Strand

**SC.8.ET.1 Identify emerging technologies that impact daily life.**

SC.8.ET.1.1      Identify the emerging features of mobile devices, smart devices and vehicles.

SC.8.ET.1.2      Identify challenges faced by users when learning to use computer interfaces.

SC.8.ET.1.3      Identify the impact of natural resources on the manufacturing of computer hardware components.

SC.8.ET.1.4      Analyze the increasing impact of access to the Internet on daily life.

**SC.8.ET.2 Investigate Artificial Intelligence (AI) and its applications.**

SC.8.ET.2.1      Explore the use of an artificial intelligence (AI) device to accomplish a task.

SC.8.ET.2.2      Discuss the utilization of intelligent behavior in technology.

*Example:* Discuss the autonomous robotic vacuum cleaner's ability to map and analyze structures to avoid obstacles.
*Example:* Analyze the advantages of implementing drones to spray crops or detect predators in an agricultural environment.

Benchmark Clarifications:
*Clarification 1:* Instruction includes speech and language understanding and computer vision.

**SC.8.ET.3 Investigate characteristics of robotics.**

SC.8.ET.3.1      Investigate the advancement of robotics.

## Cyber Security Strand

### SC.8.CS.1 Explain the physical security of devices.

SC.8.CS.1.1   Analyze threats and vulnerabilities to information security for individuals and organizations.

Benchmark Clarifications:
*Clarification 1:* Threats and vulnerabilities such as malware, phishing, smishing and hacks.

SC.8.CS.1.2   Explain how authentication and authorization methods can protect users.

Benchmark Clarifications:
*Clarification 1:* Students should examine more advanced authentication and authorization methods, such as two-factor, multifactor and biometric.

SC.8.CS.1.3   Describe defense in-depth strategies to protect simple networks.

Benchmark Clarifications:
*Clarification 1:* Instruction includes layered strategies, such as firewalls, allow and block lists, changes to default passwords and access points.

SC.8.CS.1.4   Explain how malicious actions threaten network security.

Benchmark Clarifications:
*Clarification 1:* Instruction includes malicious actions, such as social engineering, malware and hacks.

SC.8.CS.1.5   Explain how malicious actions threaten physical security.

SC.8.CS.1.6   Describe defense in depth and how physical access controls work together.

Benchmark Clarifications:
*Clarification 1:* Instruction includes authentic and digital physical access controls, such as door locks, ID cards, PIN codes, bollards, lighting, fencing, cameras and guards.

SC.8.CS.1.7   Explore the process of protecting computer hardware from exploitation.

Benchmark Clarifications:
*Clarification 1:* Instruction includes disabled or unused USB ports, windows lock screens and managed access to restricted areas.
*Clarification 2*: Instruction includes hardware, tablets, phones and other devices.

### SC.8.CS.2 Evaluate network security.

SC.8.CS.2.1     Evaluate security and privacy issues that relate to computer networks and Internet of Things (IoT) devices.

Benchmark Clarifications:
*Clarification 1*: Devices include phones, tablets, smartwatches and other emerging technologies.

SC.8.CS.2.2     Describe security and privacy issues that relate to computer networks.

SC.8.CS.2.3     Describe the permanency of data on the Internet, online identity and personal privacy.

Benchmark Clarifications:
*Clarification 1*: Instruction includes discussing the "Right to be Forgotten."

### SC.8.CS.3 Identify the consequences of social engineering.

SC.8.CS.3.1     Discuss ransomware attacks.

SC.8.CS.3.2     Discuss the necessity of immediate security updates of a program.

SC.8.CS.3.3     Identify the steps of the social engineering attack cycle.

**Computer Science 9-12**

### 9-12 Communciation and Collaboration Strand

### *SC.912.CC.1 Formulate artifacts using collaboration.*

SC.912.CC.1.1   Evaluate digital modes of communication and collaboration.

Benchmark Clarifications:
*Clarification 1:* Instruction includes examples of appropriate tools including email, instant messaging, word processors and virtual meeting software.

SC.912.CC.1.2   Utilize tools within a project environment to communicate.

Benchmark Clarifications*:*
*Clarification 1*: Instruction includes discussing the productivity of each tool.

SC.912.CC.1.3   Present information and data using presentation software.

Benchmark Clarifications:
*Clarification* 1: Instruction includes computing devices such as probes, sensors, software tools, programs and handheld devices.
*Clarification 2:* Instruction includes analyzing and presenting interactive data visualizations.

SC.912.CC.1.4   Create a digital artifact utilizing collaboration, reflection, analysis and iteration.

### *SC.912.CC.2 Defend the use of collaboration to create artifacts.*

SC.912.CC.2.1   Collaborate to publish information and data for a variety of audiences using digital tools and media-rich resources.

SC.912.CC.2.2   Assess how collaboration influences the design and development of software artifacts.

Benchmark Clarifications:
*Clarification 1:* Instruction includes comparing an individually designed project to a collaboratively designed project.

SC.912.CC.2.3   Evaluate program designs and implementations for readability and usability.

Benchmark Clarifications:
*Clarification 1:* Instruction includes evaluating programs done by third parties, peers and marketable programs.

SC.912.CC.2.4   Critique the strengths and weaknesses of the collaborative process when creating digital products.

## 9-12 Personal Health and Safety Strand

### SC.912.HS.1. Design a personalized plan for Internet practices.

SC.912.HS.1.1    Identify potential dangers to an individual's safety and security online.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the use of email, chat rooms and other forms of direct electronic communication.
*Clarification 2:* Instruction includes the dangers of direct electronic communication including predatory behavior and human trafficking.

SC.912.HS.1.2    Evaluate the consequences of cyberbullying.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the consequences for an individual engaged in bullying behavior.
*Clarification 2:* Instruction includes the consequences suffered by the victim of cyberbullying.
*Clarification 3:* Instruction includes the Jeffrey Johnson Stand Up for All Students Act.

SC.912.HS.1.3    Determine the consequences of inaction when witnessing unsafe Internet practices.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on the possible outcomes when suspicious Internet activity is not reported.

SC.912.HS.1.4    Examine the positive outcomes when someone reports suspicious behavior on the Internet.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on positive outcomes when action is taken relating to Internet reporting.
*Clarification 2*: Instruction includes reporting to parents, school staff and peers.

SC.912.HS.1.5    Evaluate the risks to personal information while accessing the Internet.

*Example:* John was on a new questionable website the previous night playing video games. When he woke up the following morning, he discovered that his email address had 30 new spam emails advertising various products. John noticed that his checking account also had $20 missing from unauthorized charges. What do you think happened and what should his following steps be?

Benchmark Clarifications:
*Clarification 1:* Instruction includes access to software, websites or web applications that do not protect against the disclosure, use or dissemination of an individual's personal information.
*Clarification 2:* Instruction includes theft of personal data including social security numbers, banking information and identity.

SC.912.HS.1.6    Describe the impact of permissible privacy and security

Benchmark Clarifications:
*Clarification 1:* Instruction includes, but is not limited to, discussing privacy and security as it relates to account settings, cookies and application permissions.

SC.912.HS.1.7    Construct strategies to combat cyberbullying or online harassment.

### SC.912.HS.2 Research and revise the effects of digital device use.

SC.912.HS.2.1    Prioritize regulating screen time and the use of electronic devices for mental and physical well-being.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the role of digital media and communication, gaming devices, cellular devices, television and other digital sources as they relate to mental and physical well-being.

SC.912.HS.2.2    Investigate the correlation between sedentary behavior and digital device use.

SC.912.HS.2.3    Assess the role of digital health trackers in promoting healthy behaviors.

SC.912.HS.2.4    Analyze the relationship between eye strain related to use of technology and exposure to increased blue light.

Benchmark Clarifications:
*Clarification 1*: Instruction focuses on blurred vision, headaches, sleep deprivation and eye fatigue.

SC.912.HS.2.5     Research the consequences associated with Nature Deficit Disorder (NDD).

### C.912.HS.3 Assess digital footprints.

SC.912.HS.3.1     Discuss the permanency of data on the Internet.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the permanency of sharing materials through digital communication and how it can affect future jobs, scholarship opportunities and potential positions.
*Clarification 2*: Instruction focuses on confirmation of legitimacy before interacting with information from others, including liking, sharing and reposting.

SC.912.HS.3.2     Analyze how social media influences the digital footprint of individuals, communities and cultures.

## 9-12 Computing Components

### SC.912.CO.1 Reflect mastery of foundational computer literacy skills.

SC.912.CO.1.1    Describe the efficiency and effectiveness of digital tools or resources used for real-world tasks.

SC.912.CO.1.2    Identify and select the file format based on trade-offs.

Benchmark Clarifications:
*Clarification 1*: Trade-offs for the most appropriate file format include analyzing the size, quality and accessibility of the file.

SC.912.CO.1.3    Select and use the correct file type for specific tasks.

SC.912.CO.1.4    Describe the relationship between drivers, hardware and operating systems.

Benchmark Clarifications:
*Clarification 1*: Instruction focuses on the driver acting as a communication bridge between hardware and the operating system.

SC.912.CO.1.5    Describe the organization of a computer and its principal components.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the identification of components by name, function and the interaction between them.

SC.912.CO.1.6    Develop and evaluate criteria for purchasing or upgrading computer system hardware.

Benchmark Clarifications:
*Clarification 1:* Instruction includes developing criteria for selecting hardware when solving a specific real-world problem.

SC.912.CO.1.7    Describe the process of protecting computer hardware from exploitation.

Benchmark Clarifications:
*Clarification 1:* Instruction includes disabled unused USB ports, windows lock screens and managed access to restricted areas.
*Clarification 2*: Instruction includes the role of hardware such as tablets, phones and other devices.
*Clarification 3*: Instruction includes the role of cyber security software.

SC.912.CO.1.8    Describe how the Internet facilitates global communication.

Benchmark Clarifications:
*Clarification 1: Instruction includes the grouping of smaller networks to provide a world wide web that facilitates communication.*

SC.912.CO.1.9    Evaluate the accuracy, relevance, comprehensiveness and bias of electronic information resources.

### SC.912.CO.2 Construct varying hardware configurations.

SC.912.CO.2.1    Explore the function of Basic Input/Output System (BIOS) and Unified Extensible Firmware Interface (UEFI) in a computer.

SC.912.CO.2.2    Explore motherboard variations.

Benchmark Clarifications:
*Clarification 1*: Instruction includes sizes, input and output, central processing unit (CPU) socket type and expansion slots.

SC.912.CO.2.3    Discuss the central processing unit (CPU).

Benchmark Clarifications:
*Clarification 1*: Instruction includes similarities and differences between CPUs.
*Clarification 2*: Instruction includes multi-core processing, hyper-threading and socket type.

SC.912.CO.2.4    Explore the role of a power supply unit (PSU) in relation to a computer system.

Benchmark Clarifications:
*Clarification 1*: Instruction includes wattage, modulation (semi, non and fully modular) and connector type.
*Clarification 2*: Instruction includes the correct wattage for devices to prevent damage.

SC.912.CO.2.5    Analyze the purpose of various random-access memory (RAM) speeds and storage sizes.

Benchmark Clarifications:
*Clarification 1*: Instruction includes temporary storage space and speed in relation to communication with the processor.
*Clarification 2:* Instruction includes how computers store different data types in random access memory (RAM).

SC.912.CO.2.6    Analyze hardware compatibility issues between industry specific devices.

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SC.912.CO.2.7    Evaluate various forms of input and output (IO).

Benchmark Clarifications:
*Clarification 1*: Instruction includes data used for or produced by input and output.

---

SC.912.CO.2.8    Evaluate the basic components of wired computer networks.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, components include a network interface card (NIC), an ethernet cable and a network switch.
*Clarification 2*: Instruction includes two or more devices to communicate on a network.

---

SC.912.CO.2.9    Evaluate the basic components of wireless computer networks.

Benchmark Clarifications:
*Clarification 1*: Within this benchmark, components include a Wi-Fi adapter and wireless access point.
*Clarification 2*: Instruction includes two or more devices to communicate on a network.

---

SC.912.CO.2.10  Explore the components of a data packet.

Benchmark Clarifications:
*Clarification 1*: Instruction includes data breaking down into packets to be routed through networks.

---

SC.912.CO.2.11  Investigate the issues that impact network functionality.

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SC.912.CO.2.12  Describe common network protocols.

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SC.912.CO.2.13  Discern how common network protocols are applied by client-server and peer-to-peer networks.

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SC.912.CO.2.14  Explore the role of dynamic host control protocol (DHCP) in a networking system.

Benchmark Clarifications:
*Clarification 1*: Instruction includes discussing how the DHCP client and DHCP server communicate.

---

SC.912.CO.2.15  Analyze the importance of subnetting.

> *Example:* Ruby is a network technician at a hospital in Ft. Pierce. Her hospital has over 100 computers active on the internet at one time. Ruby would like to reduce bandwidth lag on the outgoing internet traffic. How can Ruby utilize subnetting to solve the hospital's problem?

Benchmark Clarifications:
*Clarification 1*: Instruction includes reducing traffic and improved speeds.

---

SC.912.CO.2.16  Describe how devices are identified on a network.

Benchmark Clarifications:
*Clarification 1*: Instruction includes differentiation between public and private Internet protocol (IP) addresses.

---

SC.912.CO.2.17  Identify similarities and differences between Internet protocol versions.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the understanding that Internet protocol version 4 (IPv4) is binary and that Internet protocol version 6 (IPv6) is hexadecimal.

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SC.912.CO.2.18  Examine 2.4 gigahertz (GHz) and 5 gigahertz (GHz) wireless networks.

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### SC.912.CO.3 *Utilize various software components to create computational artifacts.*

SC.912.CO.3.1  Analyze various operating systems.

Benchmark Clarifications:
*Clarification 1*: Instruction includes similarities and differences in operating systems.

---

SC.912.CO.3.2  Develop criteria for selecting software when solving a specific real-world problem.

Benchmark Clarifications:
*Clarification 1*: Instruction includes evaluating cost, features, reliability and usability.

---

SC.912.CO.3.3  Examine the difference between operating system (OS) software and application software.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the role that operating systems play in relation to application programs.

| SC.912.CO.3.4 | Explain how automated software testing can reduce the cost of the testing effort. |

## 9-12 Programming and Software Engineering Strand

> **SC.912.PE.1 Create, implement and analyze programs that include sequencing, selection and iteration.**

SC.912.PE.1.1    Write code segments.

Benchmark Clarifications:
*Clarification 1*: Instruction includes writing code segments that accept arguments and other segments such as functions, subroutines and methods.

---

SC.912.PE.1.2    Create iterative and non-iterative structures within a program.

Benchmark Clarifications:
*Clarification 1*: Iterative structures include nested iterative structures.

---

SC.912.PE.1.3    Create selection structures within a program.

Benchmark Clarifications:
*Clarification 1*: Instruction includes explaining selection structures and their uses within a program.

---

SC.912.PE.1.4    Write a void function that does not return a value.

Benchmark Clarifications:
*Clarification 1*: Instruction includes understanding that while void functions perform a function, it does not return a value.

---

SC.912.PE.1.5    Write a non-void function that will return a value.

Benchmark Clarifications:
*Clarification 1*: Methods of function writing include the example of "Hello World" and other value-returning functions.

---

SC.912.PE.1.6    Create a nested array to aggregate data.

> *Example:* Beth has written a code segment for her programming class. She has created a list but needs her list to begin with 1 instead of 0. Create a nested array that assigns an alternative value to the numbers in her original list.

SC.912.PE.1.7   Define multiple variables to the same value while utilizing aliasing.

Benchmark Clarifications:
*Clarification 1*: Instruction includes discussing why multiple variables will not be aliased for having the same value alone; the variables must refer to the same location as well.

SC.912.PE.1.8   Define a class to store data attributes.

Benchmark Clarifications:
*Clarification 1*: Data attributes include numerical values, categories and descriptions.

SC.912.PE.1.9   Create methods that a class can inherit.

SC.912.PE.1.10  Write programs that validate user input.

SC.912.PE.1.11  Compare the differences in execution of interpreted and compiled languages.

Benchmark Clarifications:
*Clarification 1:* Instruction includes examining different programming languages and how they are converted to machine language.

SC.912.PE.1.12  Classify programming languages.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the classification of paradigms by object-oriented and procedural.
*Clarification 2:* Instruction includes the application of domains by scientific applications and commercial applications.

SC.912.PE.1.13  Describe and identify types of programming errors.

Benchmark Clarifications:
*Clarification 1:* Instruction includes syntax, logic, runtime and computation errors.

SC.912.PE.1.14  Design and implement variables in a program using global and local scope.

SC.912.PE.1.15  Implement a program using an integrated development environment (IDE) commonly used.

SC.912.PE.1.16  Explain the distinction between a programming language's standard library and the Application Programming Interface (API).

Benchmark Clarifications:
*Clarification 1:* Instruction includes facilitating programming solutions using API and libraries.
*Clarification 2:* Instruction includes explaining the role of an API in the development of applications.

---

SC.912.PE.1.17  Examine the building blocks of algorithms.

Benchmark Clarifications:
*Clarification 1:* Building blocks include sequence, selection, iteration and recursion.

---

SC.912.PE.1.18  Develop a computer program.

Benchmark Clarifications:
*Clarification 1:* Instruction includes meeting the requirements set by a plan.
*Clarification 2*: Instruction includes the use of the software development cycle.

---

SC.912.PE.1.19  Review a computer program to verify program functionality, programming styles, program usability and adherence to common programming standards.

Benchmark Clarifications:
*Clarification 1:* Instruction includes peer review.
*Clarification 2*: Instruction includes adherence to a programming language style guide.

---

SC.912.PE.1.20  Write programs that use standard logic operators.

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SC.912.PE.1.21  Use Boolean logic to perform logical operations.

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SC.912.PE.1.22  Explain structures and their uses within a program.

---

SC.912.PE.1.23  Compile, run, test and debug a digital artifact.

---

### *SC.912.PE.2 Create and analyze data to solve real-world problems.*

SC.912.PE.2.1  Create a matrix from connected lists.

SC.912.PE.2.2    Evaluate the purpose of sublist indexing.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the terms nesting and sublist can be used interchangeably.

SC.912.PE.2.3    Compare techniques for analyzing massive data collections.

### SC.912.PE.3 Apply computational thinking to real-world problems.

SC.912.PE.3.1    Evaluate arithmetic expressions using operator precedence.

SC.912.PE.3.2    Decompose a problem by defining new code segments.

SC.912.PE.3.3    Design and implement a simple simulation that is representative of a natural phenomenon.

Benchmark Clarifications:
*Clarification 1:* Instruction includes analyzing and understanding the algorithm that is representative of a natural phenomenon.

SC.912.PE.3.4    Evaluate algorithms by their efficiency, correctness and clarity.

Benchmark Clarifications:
*Clarification 1:* Instruction includes analyzing and comparing execution times, testing with multiple inputs or data sets and debugging.
*Clarification 2:* Instruction includes evaluating a well-known algorithm and implementing a new one.
*Clarification 3:* Instruction includes comparing the efficiency between two or more algorithms.

SC.912.PE.3.5    Differentiate automated testing platforms and their uses.

SC.912.PE.3.6    Explain the different types of testing that can be performed in a complex software system.

SC.912.PE.3.7    Introduce complex problems and understand that these problems may be computationally unsolvable.

SC.912.PE.3.8    Describe the concept of parallel processing as a strategy to solve large problems.

| SC.912.PE.3.9 | Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams. |

| SC.912.PE.3.10 | Simplify a complex problem by using abstraction to manage complexity using functions and parameters, classes and methods. |

| SC.912.PE.3.11 | Perform advanced searches to locate information and design a data-collection approach to gather original data. |

| SC.912.PE.3.12 | Explain how data analysis is used to enhance the understanding of complex natural and human systems. |

| SC.912.PE.3.13 | Create a computational model that utilizes data to analyze and enhance the understanding of complex natural and human systems. |

| SC.912.PE.3.14 | Analyze data by identifying patterns through modeling and simulation of real-world data. |

| SC.912.PE.3.15 | Test the accuracy of scientific hypotheses using computer models and simulations. |

SC.912.PE.3.16  Design a representation of a computer program.

Benchmark Clarifications:
*Clarification 1:* Instruction includes creating a plan that defines requirements, structural design, time estimates and testing elements.
*Clarification 2*: Instruction includes the use of the software development cycle.

SC.912.PE.3.17  Summarize the differences between an array and an array list.

SC.912.PE.3.18  Explain the principles of cryptography.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the principles of confidentiality, integrity, authentication, non-repudiation and key management.

SC.912.PE.3.19  Determine which encryption method is suitable for an intended task.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the use of digital signatures and authentication as encryption methods.

### SC.912.PE.4 Apply the software development life cycle.

SC.912.PE.4.1    Explore software development cycles that can be used to solve problems at different software development stages.

Benchmark Clarifications:
*Clarification 1*: Instruction includes the following stages: analysis, design, coding, testing, verification and maintenance.

SC.912.PE.4.2    Develop a software artifact according to a common software development methodology.

Benchmark Clarifications:
*Clarification 1:* Instruction includes various software development methodologies, including waterfall, spiral model and agile.

SC.912.PE.4.3    Identify the tools required to develop a program.

SC.912.PE.4.4    Identify the software environment required to create a program within a specific language.

*Example*: Johnny is given the assignment to create a simple addition program in his computer programming class. He decides to load a popular integrated development environment (IDE) to assist him with coding his program. Identify software environments that will aid Johnny with specific languages.

SC.912.PE.4.5    Define user prompts for clarity and usability within a program.

*Example 1:* Mrs. Jan has given her programming class the task of creating an age verification application. Paolo, a student in the class, initially runs into an issue where when a user enters their birth month out, the program crashes. Define a user prompt that will correct this issue.

SC.912.PE.4.6    Write a program that utilizes both input and output.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the end user entering the input and the program delivering the output.

SC.912.PE.4.7   Use internal documentation to collaboratively design a program according to accepted standards.

Benchmark Clarifications:
*Clarification 1:* Instruction includes multiple creators communicating within a program utilizing "clean code."

---

SC.912.PE.4.8   Create mobile computing applications and/or dynamic web pages using a variety of design and development tools, programming languages and mobile devices/emulators.

Benchmark Clarifications:
*Clarification 1:* For this benchmark and depending on the task, students can create mobile computing applications, create dynamic web pages or create mobile computing applications and dynamic web pages.

**9-12 Technological Impact Strand**

> ### *SC.912.TI.1 Assess the impact of technological advancements.*

SC.912.TI.1.1    Analyze historical trends in hardware and software.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing technology upgrades for power requirements, computation capacity, speed, size, Artificial Intelligence (AI) and ease of use.
*Clarification 2*: Instruction includes assessing the implications of technology trends on future computing devices.

---

SC.912.TI.1.2    Identify ways to use technology to support lifelong learning.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the use of online tutorials, Artificial Intelligence (AI) and web searches to facilitate personal learning.

---

SC.912.TI.1.3    Analyze the impact of digital media.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the analysis of digital media for implicit or explicit bias.
*Clarification 2*: Instruction includes discerning fact from opinion within digital media.

---

SC.912.TI.1.4    Analyze the impact of digital media on culture and persona.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the effects of digital media on self- image and societal changes.

---

SC.912.TI.1.5    Describe the impact of computing on business and commerce.

---

SC.912.TI.1.6    Describe how technology impacts personal life.

Benchmark Clarifications:
*Clarification 1:* Instruction includes evaluating the impact of smartwatches and various Internet of Things (IoT) devices.

---

SC.912.TI.1.7    Evaluate ways in which technology may improve accessibility for the varying needs of learners, including students with disabilities (SWD).

Benchmark Clarifications:
*Clarification 1:* Instruction includes assistive and instructional technologies.

---

SC.912.TI.1.8    Explain how economic and societal factors are affected by access to critical information.

SC.912.TI.1.9    Evaluate access and distribution of technology in a global society.

Benchmark Clarifications:
*Clarification 1:* Instruction includes providing possible solutions to the challenges to equal access and the distribution of technology.

SC.912.TI.1.10    Analyze technology-related career paths.

Benchmark Clarifications:
*Clarification 1:* Technological career paths include programming, medical, health information technology (IT) and various other upcoming industries.
*Clarification 2:* Instruction includes predicting future technology-related career trends.

SC.912.TI.1.11    Evaluate the benefits of technology regarding environmental concerns.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, the expectation is that students will recognize occurrences such as a technological drought and its impact on the surrounding area.

SC.912.TI.1.12    Examine the history of networking devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes hubs, switches, ethernet cabling, wireless technology and fiber optics.

SC.912.TI.1.13    Examine the historical impact of social media.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the purpose of social media.
*Clarification 2*: Instruction includes analyzing the impact of current social media platforms.

### SC.912.TI.2 Research and apply the use of tools for regulatory compliance.

SC.912.TI.2.1    Research how social media and technology can be used to distort, exaggerate or misrepresent information.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the consequences associated with posting misinformation, such as slander, libel and defamation.
*Clarification 2*: Within this benchmark, emphasis should be placed on the impact of misinformation (clickbait, gaslighting, fake news, propaganda and deepfakes) on individuals, communities and cultures.

SC.912.TI.2.2    Demonstrate knowledge of the Internet safety policy as it applies to state and district guidelines.

Benchmark Clarifications:
*Clarification 1:* Instruction focuses on the current school district guidelines in which the student is enrolled.
*Clarification 2:* Instruction includes local and state level statutory requirements that govern Internet use.

SC.912.TI.2.3    Recognize the terms and policies associated with the use of public access points.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that using public access points may pose security risks.
*Clarification 2:* Instruction includes discussing the importance of reading the full terms and conditions when using public access points.

SC.912.TI.4    Explore the legal ramifications of technology use.

Benchmark Clarifications:
*Clarification 1:* Instruction includes differentiating between legal and ethical responsibility.
*Clarification 2*: Instruction includes understanding the importance of staying current with legal changes.

SC.912.TI.2.5    Describe and model the legal use of modern communication media and devices.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the responsible use of modern communication media and devices.
*Clarification 2:* Instruction includes discussion of personal safety when utilizing technology.

SC.912.TI.2.6    Evaluate the impacts of the irresponsible use of information on collaborative projects.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing plagiarism, artificial intelligence (AI) chat usage and falsification of data.

SC.912.TI.2.7    Describe differences between open source, freeware and proprietary software licenses and how they apply to different types of software.

SC.912.TI.2.8    Evaluate the consequences of misrepresenting digital work as your own.

Benchmark Clarifications:
*Clarification 1:* Instruction includes plagiarism, infringement and digital theft.

SC.912.TI.2.9    Analyze how different categories of software licenses can be used to share and protect intellectual property.

Benchmark Clarifications:
*Clarification 1:* Types of software licenses include open source and proprietary licenses.

SC.912.TI.2.10   Analyze how access to information may not include the right to distribute the information.

Benchmark Clarifications:
*Clarification 1:* Instruction includes comparing licensing in relation to ownership and distribution.

SC.912.TI.2.11   Utilize citation tools when using digital information.

SC.912.TI.2.12   Describe legal regulations that govern Internet usage and interaction.

## 9-12 Emerging Technologies Strand

**SC.912.ET.1 Analyze the impact of emerging technologies on daily life.**

SC.912.ET.1.1   Describe the emerging features of mobile devices, smart devices and vehicles.

SC.912.ET.1.2   Describe the physical and cognitive challenges faced by users when learning to use computer interfaces.

SC.912.ET.1.3   Analyze the process and design innovative software to support specialized forms of human-computer interaction.

SC.912.ET.1.4   Examine device-to-device interactions that exclude human input.

Benchmark Clarifications:
*Clarification 1:* Instruction includes making the connection to machine-to-machine (M2M) interaction.

SC.912.ET.1.5   Explore the concepts of virtual and augmented reality.

SC.912.ET.1.6   Analyze the impact on natural resources due to manufacturing of computer hardware components.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the shortage of semiconductors due to increased demand and lack of available resources.

SC.912.ET.1.7   Describe how technology has changed the way people build and manage organizations and how technology impacts personal life.

**SC.912.ET.2 Analyze the impact of Artificial Intelligence (AI) and its applications.**

SC.912.ET.2.1    Explore the history of Artificial Intelligence (AI).

Benchmark Clarifications:
*Clarification 1:* Instruction includes the application of AI tests.
*Clarification 2*: Instruction includes how these tests have evolved along with AI.

SC.912.ET.2.2     Describe the major branches of Artificial Intelligence (AI).

Benchmark Clarifications:
*Clarification 1:* Major branches include expert systems, natural language processing, machine perception, machine learning and generative AI.

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SC.912.ET.2.3     Evaluate the application of algorithms to Artificial Intelligence (AI).

Benchmark Clarifications:
*Clarification 1:* Instruction includes acknowledging AI measurement tests are algorithms.
*Clarification 2*: Instruction includes discussing how algorithms can be used to enhance the effectiveness of AI.

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SC.912.ET.2.4     Evaluate the Artificial Intelligence (AI) of computers to model human behaviors.

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SC.912.ET.2.5     Describe major applications of artificial intelligence (AI) and machine learning.

Benchmark Clarifications:
*Clarification 1:* Instruction includes discussing the applications to the medical, space and automotive fields.

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SC.912.ET.2.6     Describe how predictive Artificial Intelligence (AI) can be used to solve problems.

Benchmark Clarifications:
*Clarification 1:* Instruction includes using predictive Artificial Intelligence (AI) to forecast trends, such as sports, the stock market and weather.

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SC.912.ET.2.7     Describe common measurements of machine intelligence.

Benchmark Clarifications:
*Clarification 1:* Common measurements include the Turing test and the Lovelace test.

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### SC.912.ET.3 Analyze characteristics of robotics.

SC.912.ET.3.1     Describe the advancement of robotics.

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SC.912.ET.3.2     Examine how robotics are used to address human challenges.

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SC.912.ET.3.3    Evaluate how the natural world has influenced robotic designs.

Benchmark Clarifications:
*Clarification 1:* Instruction includes both functionality and physical attributes.

## 9-12 Cyber Security Strand

### SC.912.CS.1 Assess and apply physical security strategies.

SC.912.CS.1.1  Identify possible risks to maintaining data confidentiality.

Benchmark Clarifications:
*Clarification 1:* Within this benchmark, risks include shoulder surfing, illicit access to devices and theft of sensitive items.

SC.912.CS.1.2  Describe computer security vulnerabilities.

Benchmark Clarifications:
*Clarification 1:* Instruction includes student understanding that a computer worm can replicate itself across the network without human interaction while a computer virus requires human interaction to replicate.

SC.912.CS.1.3  Evaluate computer security vulnerabilities.

Benchmark Clarifications:
*Clarification 1:* Instruction includes evaluating the effects of attacks on computer systems.
*Clarification 2:* Instruction includes evaluating the social and economic impacts on people.

### SC.912.CS.2 Research and analyze network security impacts.

SC.912.CS.2.1  Analyze security and privacy issues that relate to computer networks and network connected devices.

SC.912.CS.2.2  Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity and privacy.

SC.912.CS.2.3  Apply network security concepts and strategies to real-world simulations.

### SC.912.CS.3 Reflect on the consequences of social engineering.

SC.912.CS.3.1  Investigate ransomware attacks.

SC.912.CS.3.2  Explore access control rules.

SC.912.CS.3.3  Analyze the limitations of a program's temporary storage and the security vulnerabilities.

SC.912.CS.3.4  Trace the social engineering attack cycle.

Benchmark Clarifications:
*Clarification 1:* Instruction includes the various ways of collecting information, relationship building and how that information is used for exploitation.
*Clarification 2:* Instruction includes discussing and evaluating the social and economic impact of the cycle on computer systems and people.

## 9-12 Digital Currencies and Financial Management Strand

### SC.912.DC.1. *Analyze the history of cryptocurrency.*

SC.912.DC.1.1    Examine the history of digital currency and blockchain technologies.

SC.912.DC.1.2    Analyze the effects of digital currencies on the current financial market.

Benchmark Clarifications:
*Clarification 1:* Instruction includes understanding that the value of a digital currency can be very volatile.

### SC.912.DC.2. *Examine the types of digital currencies.*

SC.912.DC.2.1    Differentiate between a digital currency and a security.

Benchmark Clarifications:
*Clarification 1*: Instruction includes securities serving as a placeholder of ownership or equity in an organization.

SC.912.DC.2.2    Discuss the risks associated with digital currencies.

Benchmark Clarifications:
*Clarification 1:* Instruction includes currencies that show no proof of work (POW) in blockchain.

SC.912.DC.2.3    Compare decentralized currencies to centralized currencies.

### SC.912.DC.3. *Evaluate and analyze digital tools used for financial management.*

SC.912.DC.3.1    Evaluate digital tools that aid in personal financial literacy and money management.

Benchmark Clarifications:
*Clarification 1:* Instruction includes digital accounting tools, digital wallets and budgeting applications.

SC.912.DC.3.2    Analyze the opportunities created with digital stock portfolios.